GOLD

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Panning Championships

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COVER: Photographer Jeff Scovil has captured the dramatic beauty of the "Dragon," the world's finest crystallized gold specimen. Read more about it beginning on page 12.

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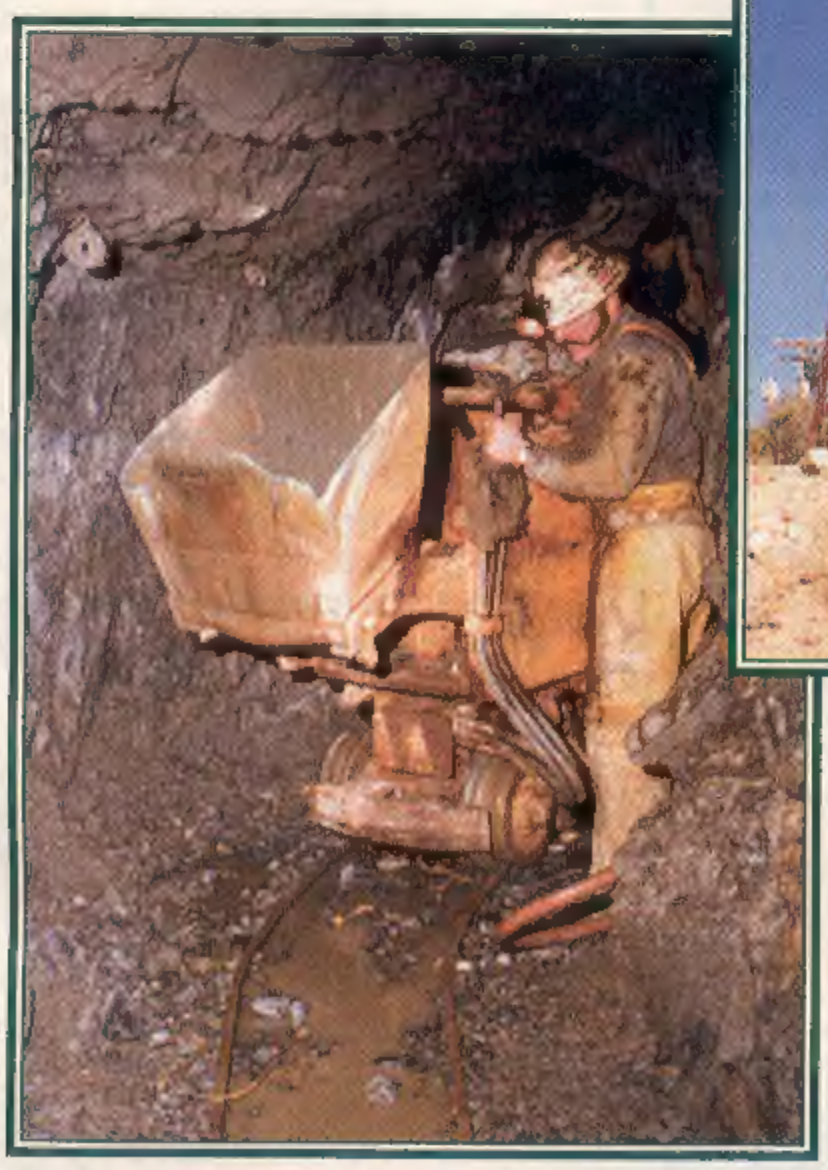
THE WORLD'S FINEST

Seen frontside on our cover, the "Dragon" is equally impressive from the back. (Photo by the author. Courtesy: Collector's Edge, Golden, CO)

CRYSTALLIZED GOLD SPECIMEN

This is the thrilling site the finders had of the "Dragon" when it was discovered at the Colorado Quartz Mine.



The headframe of the Colorado Quartz Mine is shown above, right. It was from its stygian depths (above) that Larry Letho and his crew brought to light the world's greatest crystallized gold specimen in 1998.

The "Dragon" Has Surfaced In Mariposa County

by Bob Jones

It was just a year ago that I reported on my trip underground to the Colorado Quartz Mine in Mariposa County, California. You may recall that the Colorado Quartz Mine has been an important producer of beautifully crystallized gold specimens for decades. Specimen recovery has been sporadic but wondrous ... when successful.

To my dismay, there was no gold-filled pocket of crystals when I visited the mine. But in my article on this subject a year ago, I predicted that the diligent work of Larry Letho and his crew of Shame Kimbro, Allen Seymour and Noble Sparks would eventually be successful. I did not dream at the time that they were about to discover what is considered by some to be the world's finest crystallized gold specimen ever mined and preserved!

continued on page 14

World's Finest/ *from page 13*

Now called "The Dragon" because of its lifelike resemblance to that mythical creature, The Dragon is no myth! Rather, it is a 7-ounce, 9-inch-high spray of brilliant octahedral and trigon gold crystals perched on a mass of fractured quartz as if poised to strike. And strike it does, striking amazement and wonder in the hearts of true lovers of this finest of precious metals.

To describe The Dragon as beautiful is woefully inadequate. Words simply cannot truly convey the breathtaking beauty and striking aesthetics of this most rare of crystallized gold specimens.

The story of this find is one of hard work and analytical observation by geologist Letho. It is also the story of technical extraction and preservation of nature's rarest gift: a crystallized specimen. That part of the story tells how Bryan Lees, lately of rhodochrosite fame, used techniques developed, over years of successful specimen mining, to extract and preserve a specimen that could well have been just another fragmented loose group of nice gold crystals.

The discovery of the gold was due to an understanding of how gold occurs in the mine. The gold-bearing vein follows the contact between meta-andesite and slate. Yet, the vein is barren for the most part. Only when small microfaults, called cutters, cross the vein does gold get deposited ... and then only very infrequently.

In January 1998, Larry and his crew were working the vein, seeking cutters that might allow openings where gold could crystallize. Once they encountered such cutters, Larry brought out a big metal detector to scan for potential occurrences. When such an occurrence was detected, hand work began. When they encountered the gold-bearing pocket, which contained just the one specimen, it was immediately realized the specimen rested on extremely fractured and friable quartz.

This is where Bryan's expertise came into play. Using a diamond-toothed saw and other specialized equipment, the pocket was opened to expose, but not disturb, the gold. Once exposed, the gold, with its matrix, was actually splinted, braced and wrapped with wire in place to hold it together for removal from the pocket and later for transport from the depths.

Once it was extracted, the specimen was taken to the Collector's Edge laboratory in Golden, Colorado, for preparation as a display specimen. The fractured-quartz matrix was stabilized and the entire specimen cleaned. Remarkably, the brilliant mass of gold required no cleaning, no treatment of any kind. So you see it today exactly as the crew saw it when it was first exposed in its crystal pocket.

Is it the world's finest gold specimen? Look at the cover of this issue and decide for yourself. Better yet, attend the Tucson Gem and Mineral Society's show February 11-14 and see it in person!

Shop Talk

by William A. Kappele

What To Do With All That Pyrite

A few years back, I wrote an article about the uses of pyrite. In the article I admitted that I am a pyriteoholic. Cora and I have collected pyrite samples from just about everywhere we've been, and we have a mountain of it.

Now, *our* pyrite is not those clusters of humongous cubes that we all see in the rock shops, but have never seen in the wild. (I think those are made somewhere in Taiwan and sold only to rock shops!) No, ours is just run-of-the-mill twinkly stuff in matrix which ranges from sand to beautiful white quartz. I love the stuff, but there came a time when I would either have to find something to make out of it or order one of those dumpsters to be put on the street in front of my house and have a funeral service for my pyrite pile. After a little exercising of the brain cell (singular), I did come up with a few ideas. Here they are:

1. For those of you lucky enough to have some samples of pyrite in nice, solid, white quartz, the choice of what to do with it is obvious. This material cuts and polishes into beautiful cabs. The pyrite undercuts a bit, but this does not detract from the beauty of the gem.

2. Pieces of the white quartz material which are too small to cut into cabs can be used on stick pins, earrings, etc. Just grind little flat spots for gluing them to the findings.

3. If you have some pieces which are really pretty, but are so soft or fractured that it is impossible to cut cabs that will hold together, you still have the option of turning this kind of material into cabs by making it into doublets or triplets.

There are a couple of ways of doing this. One way is to cut a flat face on your rough, leave it in the saw vise, clean the face well with solvent, and cement the quartz or glass cap on it. When the cement has dried, cut the thin slice of material and the cap off, as a unit. Another way is to cut the flat, clean it and cover the flat with epoxy or cyanoacrylate. When this has dried, cut a thin slice of the material and cap it with glass or quartz. With either method, if the material is really soft, it may be wise to cut a thin slice of some good backing material and use it to make the stone into a triplet.

4. Electroplating and electroforming also offer excellent ways to use your pyrite "jewels." Very nice pendants can be made by picking a nicely shaped piece and backing and framing it in gold. To do this, begin by coating the back and edges with a heavy coat of epoxy. If you can find a product called "epoxy gel" in a hobby shop, it is excellent for this process. It goes on thick, and stays where you put it, rather than running, as most epoxies have a tendency to do.

If your stone is very rough, you may want to grind it a little just to smooth it out before putting the epoxy backing on it. In addition, you may want to use several coats of epoxy to smooth it out. If the matrix is so soft that the little pyrite cubes tend to fall out, dribble a little of the thin cyanoacrylate on the face of the pendant. This will penetrate and lock the cubes in place, and it will not be noticeable when you are finished. Now glue on a jump ring, bell cap or whatever your preference may be for attaching the pendant to the chain. From here on, just follow whatever procedure you use for plating nonmetallic objects.

Your solutions may or may not react with the pyrite or the matrix, so try a scrap first. If there is a problem, use one of the commercially available products and cover the portion you don't want plated.

5. Small solid pieces which are not suitable for cabs are also great candidates for wirewrapping. There are several books on the market which detail the technique of wirewrapping. It isn't difficult to do, but it would take far more space than we have here to explain it. The best style, however, for small, irregular pieces is a simple cage. This works well for any hanging pieces, such as pendants and earrings.

6. Finally, there is the old standby: plastic embedding. A few years ago, this was the thing to do. Casting resin was used to embed everything from flowers to old pocketwatch parts. The resin is still readily available at craft stores, but the plastic molds are a little hard to find. This is not a really big problem, since all kinds of things can be used as molds. The big trick is just what to make.

Although anything from pulls on your ceiling fan to transparent window hangings are good possibilities, my favorite is paperweights. I guess the reason for this is that I have so much paper all over the place, and it is easier to hold it down than to get rid of it.

Well, there are some suggestions. Go dig out some pyrite and start creating.

Rock Science

by Steve Voynick

Tick, Tock, Cesium Clock

For half a century atomic clocks have provided us with amazingly accurate time. The National Institute of Standards & Technology (NIST) operates this nation's current atomic clock, called NIST-7, at its Boulder, Colorado, laboratory. NIST-7 loses or gains a mere one second every million years. Expressed differently, had NIST-7 been operating since the extinction of the dinosaurs 65 million years ago, it would have lost or gained only about one minute.

The heart of NIST-7 is the element cesium, the source of which is the mineral pollucite. Pollucite, or cesium sodium aluminum silicate, forms the cesium-rich end member of a series with analcime, a zeolite familiar to mineral collectors. Pollucite was once obtained from hand-cobbed ores mined in Maine and South Dakota. Today, Canada and Africa supply most of the world's pollucite. Cesium also occurs in such pegmatite minerals as lepidolite and feldspar.

Cesium, one of the alkali metals, is a soft, white, chemically reactive metal that melts at just above room temperature.

It became the world's timekeeper through a natural progression of timekeeping technology. Until this century, mechanical pendulum clocks—accurate to about 20 seconds per year—sufficed as international and frequency standards. Quartz clocks, accurate to three seconds per year, took over in the 1920s. To keep time, quartz clocks relied on quartz's natural vibration frequency of 32,768 cycles per second.

But, it was learned, far-higher molecular and anatomic frequencies had even greater potential for accurate timekeeping. In the 1920s, physicists had learned that all bound molecular and anatomic systems have very specific energy levels. After electromagnetic fields boost energies to higher levels, molecules and atoms return to their normal levels by steadily emitting excess microwave energy. Although the actual quantum mechanics are considerably more complex, molecules and atoms basically absorb and emit microwave energy at precise and extremely stable resonance frequencies—the ideal basis for time and frequency standards.

In 1949, the National Bureau of Standards (now NIST) unveiled the first ammonia clock. Utilizing the resonance of nitrogen atoms within ammonia molecules, the ammonia clock proved far more accurate than the best quartz clocks. More importantly, the ammonia clock laid the groundwork for true "atomic-beam" clocks.

Researchers turned to cesium-133, a cesium isotope with a stable atomic resonance of more than 9 billion cycles per second. In 1952, the first cesium clock demonstrated astounding accuracy: one-one-hundred-thousandth of a second per day—surpassing even the accuracy of astronomical time. In operation, a beam of cesium atoms at its natural resonating frequency precisely governs the frequency of an electromagnetic field. The field then induces highly regulated electrical current, which operates conventional electric clocks and other instruments.

NIST-7, the advanced cesium clock in use today, will soon be fine-tuned to an accuracy of 0.0000000003 seconds per year—an accuracy that represents only a 20-second error since the extinction of the dinosaurs.

If your $10 quartz watch provides all the accuracy you need, you might ask, "So what?" Well, superaccurate time plays a big role in our high-tech society, beginning with atomic-clock synchronized commercial radio time tones. Superaccurate time is also critical in defense and navigation technologies. For example, the Global Positioning System (GPS), today's state-of-the-art navigation and locating tool, relies on a network of satellites, each carrying an onboard atomic clock. And superaccurate time is essential for such space-navigation procedures as injecting spacecraft into distant planetary orbits and for radio-telescope probes of deep space.

Back on Earth, superaccurate time control minimizes data-transmission rates on the Information Superhighway, made up of combined telephone, FAX, video and computer networks. Atomic clocks are also prerequisites for research into relativity to further define our interrelated concepts of time, mass, dimension and velocity.

So, yes, superaccurate time is, indeed, relevant. And it's remarkable to think that it all begins in basaltic vugs filled with delicate white crystals of cesium-bearing pollucite.

When you watch the big red ball drop in Time Square this New Year's Eve, ponder that.

WORLD CLASS Gold Panning

Combining The Championships With California's Gold Discovery Sesquicentennial

by Norma and Skip Ingalls

The California gold rush made America a more restless nation—changed the people's sense of their future, their expectations and their values," wrote historian J. S. Holliday. "Suddenly there was a place to go where everyone could expect to make money quickly; where life could be freer; where one could escape the restraints and conventions and the plodding sameness of life ..."

The discovery of gold on January 24, 1848, in Coloma, California, changed the face and course of the United States. Before that day, California had a non-native population of barely 18,000. The influx of prospectors discovered enough gold to start several business empires; pay off an enormous federal debt; encourage the population to leap across the continent; build an intercontinental railway; and allow innovation and change to flourish in California, dragging a reluctant nation in its wake.

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California's sesquicentennial celebration included displays at Sutter's Mill in Coloma (left) and a 13-pound nugget from the original 16-1 Mine in Allegheny (above). Action at the Panning Championships was fun and intense. The Women's Skilled finalists (opposite, above) showed camaraderie before their event. The Men's Skilled finalists (opposite, below) were all business.

15
14
13
12
Chevrea
Aggregates

El Dorado
Chevrea
Aggregates Inc
24
28

Gold Panning/ *from page 21*

During 1998, thousands of visitors from around the world descended on the normally quiet streets of Coloma, now a California State Historic Park. At the Gold Discovery Days sesquicentennial celebration in January, Governor Pete Wilson helped kickoff the statewide, three-year celebration of the 1848 gold discovery, the 1849 gold rush and the fact that California had become one of the United States in 1850. Other events in 1998 included a tall ships race from San Francisco to San Diego and the World Gold Panning Championship.

During the Championships, held in Coloma from September 28 through October 4, both original and restored buildings lining the main street were bordered with white canvas tents and wagons depicting the wild days of the gold rush. Tourists in T-shirts rubbed shoulders with buckskin-clad frontiersmen, bearded prospectors, Maidu natives and women dressed in bonnets and long, homemade dresses of days gone by. Meat roasted and pots of beans simmered over open fires. The music of fiddles filled the air. Each breeze fluttered tent flaps, hides hanging from poles, colorful flags and bunting.

Over all the celebrants loomed the dark beams of Sutter's Mill. "It was a rainy afternoon when Mr. Marshall arrived at my office in the Fort, very wet. ... He told me that he had some important and interesting news which he wished to communicate secretly to me, and wished me to go with him to a place where we should not be disturbed." So began John A. Sutter's telling of his first knowledge of James Marshall's discovery to Hutchings' *California Magazine*, published in November 1857.

"Then Marshall began to show me this metal, which consisted of small pieces and specimens, some of them worth a few dollars ... after having proved the metal with *aqua fortis*, which I found in my apothecary shop, likewise with other experiments, and read the long article 'Gold' in the Encyclopedia Americana, I declared this to be gold of the finest quality, of at least 23 carats. ... By the sudden discovery of the gold, all my great plans were destroyed."

The idealized year of the gold rush was 1848, a time when no self-respecting prospector would steal from another camp; gold bags were even left in unoccupied tents. The country was open to any honest person willing to work hard. Those using slaves to dig gold for them were scorned as lazy and useless.

Men used the tip of a hunting knife to pop nuggets from cracks in the bedrock. By the end of the year the word was out: This was no rumor from far away, *gold* littered the landscape of fabled California.

In this 150th anniversary of the gold discovery, delegations from more than 20 countries descended on northern California, seeking that gold rush euphoria. During the entire course of the celebration, Coloma again echoed with a cacophony of languages, old-time music, living-history demonstrations and a merchants' market. Tours were conducted through local gold mines, historic buildings, James Marshall's Monument,

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Throughout last year, thousands of visitors from around the world descended on Coloma to take part in celebrations marking the sesquicentennial of the discovery of gold in California—including panning in the American River.

Gold Panning/ *from page 22*

the pioneer cemeteries and the Monroe Ridge Trail overlooking Coloma and the South Fork of the American River.

A special daily highlight for visitors was the Nugget Race. All entrants were assured that the gravel pile they dug into was salted with gold and marked pennies for prizes. Panning continued until all the gravel was scooped up. If someone got between the participants and the river, it gave a whole new meaning to the term gold "rush."

Experienced panners—both individuals and teams—competed at a world class level. However, many beginners also entered the contest and learned the special rules. Be aware that this is "smash and grab" panning, no wimpy slowpokes would win a medal. Participants had to have supreme confidence that gold really is heavier than sand and gravel. It would be waiting in the bottom of the pan, no matter how violently anyone swirled and sloshed.

Charlie Brown, master of ceremonies for the competition, gave a bare bones explanation of the rules each contestant must obey. "We give them a bucket of sand and gravel salted with flakes of gold. Each group of contestants has a different number of pieces to find, but they aren't told what that number is. They're penalized five minutes for each lost piece but speed counts. When each contestant thinks they're finished, they have to stopper their gold bottle and wave the pan over their head so the judges can see them and the number on their bib. Every 10th of a second is important."

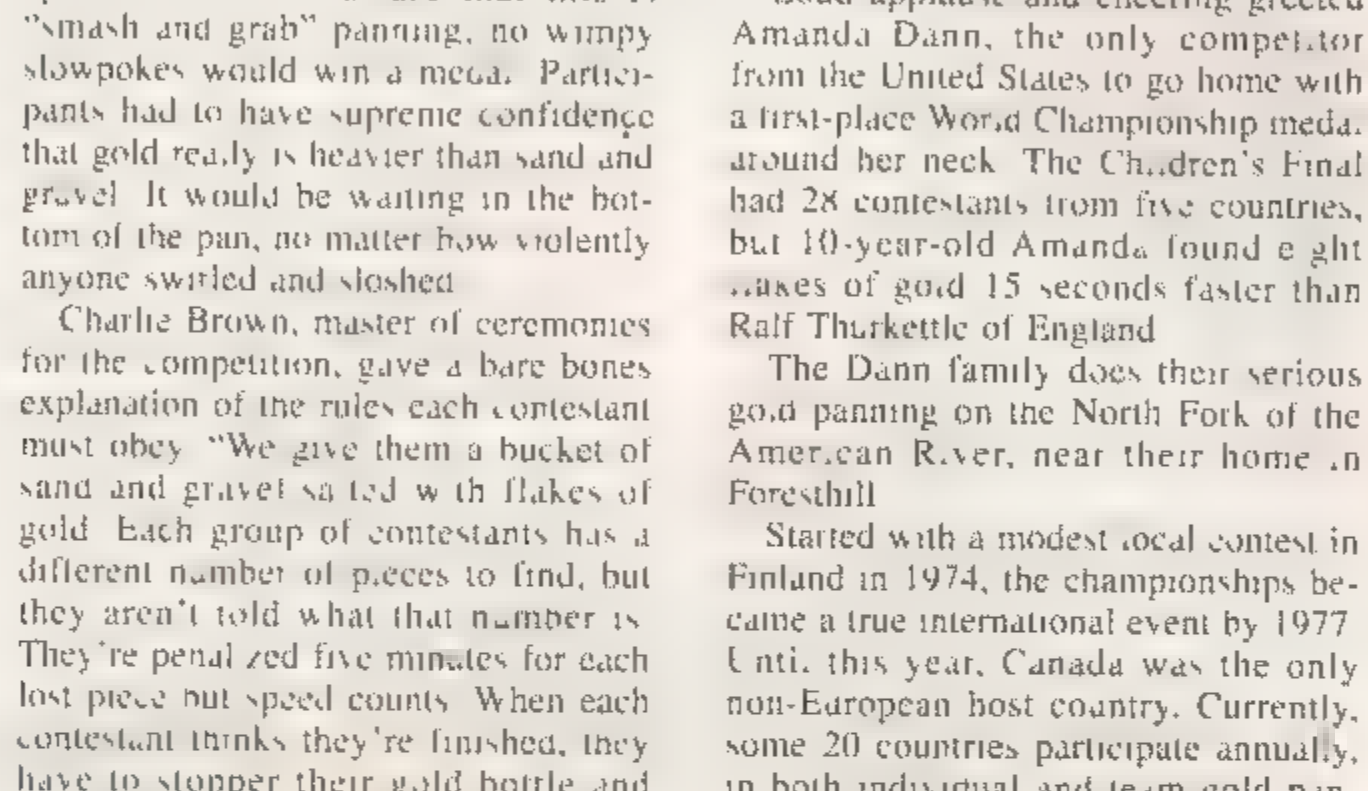
Ask Giorgio DeLorenzi, from Italy. With a time of 2:32.75, he lost third place to Sweden's Sten Bergstrom, *his* time was 2:32.10. Speed was so critical for the Men's Skilled Division that the top 12 finishers found seven of the eight flakes in their gravel buckets.

Finnish cabinetmaker Veikko Keranen used his own handmade wooden pan to win first place. Winner in the Women's Skilled Division was Marlise Ludi, she was so overwhelmed with emotion that she burst into tears on the podium. Born in Switzerland, she grew up near John Sutter's hometown.

Loud applause and cheering greeted Amanda Dann, the only competitor from the United States to go home with a first-place World Championship medal around her neck. The Children's Final had 28 contestants from five countries, but 10-year-old Amanda found eight flakes of gold 15 seconds faster than Ralf Thurkettle of England.

The Dann family does their serious gold panning on the North Fork of the American River, near their home in Foresthill.

Started with a modest local contest in Finland in 1974, the championships became a true international event by 1977. Until this year, Canada was the only non-European host country. Currently, some 20 countries participate annually, in both individual and team gold panning events.



The Gold Discovery Days sesquicentennial celebration featured living-history demonstrations, including the refining of gold "en plein air."

Finland overwhelmed Coloma with fluttering blue and white flags, lusty singers and musicians and, most of all, contestants. "We brought about 100 people to California," said Inkeri Syrjanen, secretary of the World Gold Panning Association. Final preparations for the 1998 World Gold Panning Championship began with Rosanne McHenry's visit to the 1994 Championships in Austria.

As chief ranger of the Marshall Discovery State Historic Park in Coloma, McHenry hoped to coordinate the Championships with California's Sesquicentennial celebration. But Japan and New Zealand were also bidding to be host countries. In the end, the synergy of combining the Championships with the 150th gold discovery anniversary, at the site of that world-shaking event, won over the World Gold Panning Association's voting members. Of course, a case of California wine might have helped that decision-making process somewhat.

For the last three years, the U.S. National Gold Panning Championships have been held in Coloma. McHenry, other Marshall Discovery Park employees and many hard working volunteers used these experiences to work out the kinks of putting on an international event drawing over 400 competitors and some 16,000 spectators. For the last year, they finally have had support from the "California Gold Discovery to Statehood Sesquicentennial" organization. Financial backing was recently received from State Farm Insurance and several local companies, as well.

Preparations for future championships were in high gear. Australia, named to host the competition in 2001, expanded plans for that event while defending its 1997 World National Team title, they lost the 1998 title, finishing behind Italy, Canada and France. Representatives from the Czech Republic were watching the competition management, since they will be the host country for the 1999 Championships. And from Japan came a delegation headed by Hiroshi Nishimoto, again bidding to host a future World Gold Panning Championship.

For the seekers of gold and medals, the experience is often more valuable and more certain than finding wealth. "Seeing the elephant" was a gold rush catch phrase for those who had played the game and lost. "I have come back poor," said many '49ers, "but I have seen the elephant." During this Sesquicentennial Celebration, everyone coming to California's Mother Lode Gold Country is guaranteed to see the elephant and, if they got lucky, take home their own gold nugget.

continued on next page

A highlight of Gold Discovery Days was the "Nugget Race" The gravel was salted with gold and marked pennies for prizes.

WINNERS 1998 WORLD GOLD PANNING CHAMPIONSHIPS

WOMEN'S SKILLED DIVISION FINAL

1 Marlise Ludi Lauperswil, Switzerland
2 Maija Nienoft, Tankavaara, Finland
3 Helena Rezna, Trencin, Slovakia

---

21 Joyce Schickling, El Dorado, California

MEN'S SKILLED DIVISION FINAL

1 Veikko Keranen, Kivijanta, Finland
2. Pavel Lhotsky, Prague, Czech Republic
3. Sten Bergstrom, Lidingo, Sweden

---

22 Alan Watson, Camino California

NATIONAL TEAM FINAL

1 Italy
2. Canada
3 France

---

5 USA

OPEN TEAM FINAL

1 Finland Moonshine Panners
2 Italy - Maripomi
3 Italy Giorgio DeLorenzi

---

13 USA John Joseph (Sacramento)

YOUTH FINAL

1 Pia Keranen, Tankavaara, Finland
2 Christopher Rauschnot, Woodland, California
3 Heidi Hongisto, Tankavaara, Finland

CHILDREN'S FINAL

1. Amanda Dann, Foresthill, California
2. Ralf Thurkettle, Norfolk, England
3 Monica Nordling, Dawson City, Yukon, Canada

SENIOR FINAL

1 Matti Karkkainen, Saariselka, Finland
2 Frederic Bouton, Audincourt, France
3 Anita Patana, Tankavaara, Finland

---

9. Mike Sutton, Grants Pass, Oregon

WOMEN'S BEGINNER FINAL

1 Wendy Barker, Australia
2. Beth Palmer, Melbourne, Victoria, Australia
3 Renee Wilson, Shingle Springs, California

MEN'S BEGINNER FINAL

1 Jaroslav Sykora, Praha, Czech Republic
2 Scott Terrell, Truckee, California
3 Michael Penney, Smith River, California

TONOPAH AND GOLDFIELD

A panoramic view of Tonopah, looking west toward Mount Brougher. The Tonopah Historic Mining Park in the foreground includes the Mizpha, Desert Queen and Silver Top mines.

Collecting rocks at the Tonopah-Belmont Mine dump behind, Tonopah. Foundations of the mine are in the background.

They Were The Hub Of Nevada's Gold Rush

by Roger McPherson

Located just 25 miles apart, the great discoveries at Tonopah in 1900 and Goldfield in 1902 helped Nevada emerge from a quiet period and reawakened exploration in the West. "Tonopah is the center of things," says Viola Whipperman, the assistant curator of the Central Nevada Museum in Tonopah. "We're roughly 240 miles from Reno and 200 miles from Las Vegas."

These silver and gold-rush towns in central Nevada still retain their stately buildings and mining history. There's the Mizpah Hotel in Tonopah, "the best stone building in Nevada," some say, named after Jim Butler's great Mizpah Mine (which was staked by his wife, Belle).

The Central Nevada Museum at the south edge of town is full of information about the glory days in Tonopah and Goldfield. On the grounds next to the museum are typical mining-camp buildings, a railroad scale building and equipment, from hand tools to modern machinery.

Just back of town, on Mount Oddie's slope, a mining park with the great Mizpah Desert Queen and Silver Top Mines has walking tours of its open stopes, hoists, headframe and power houses.

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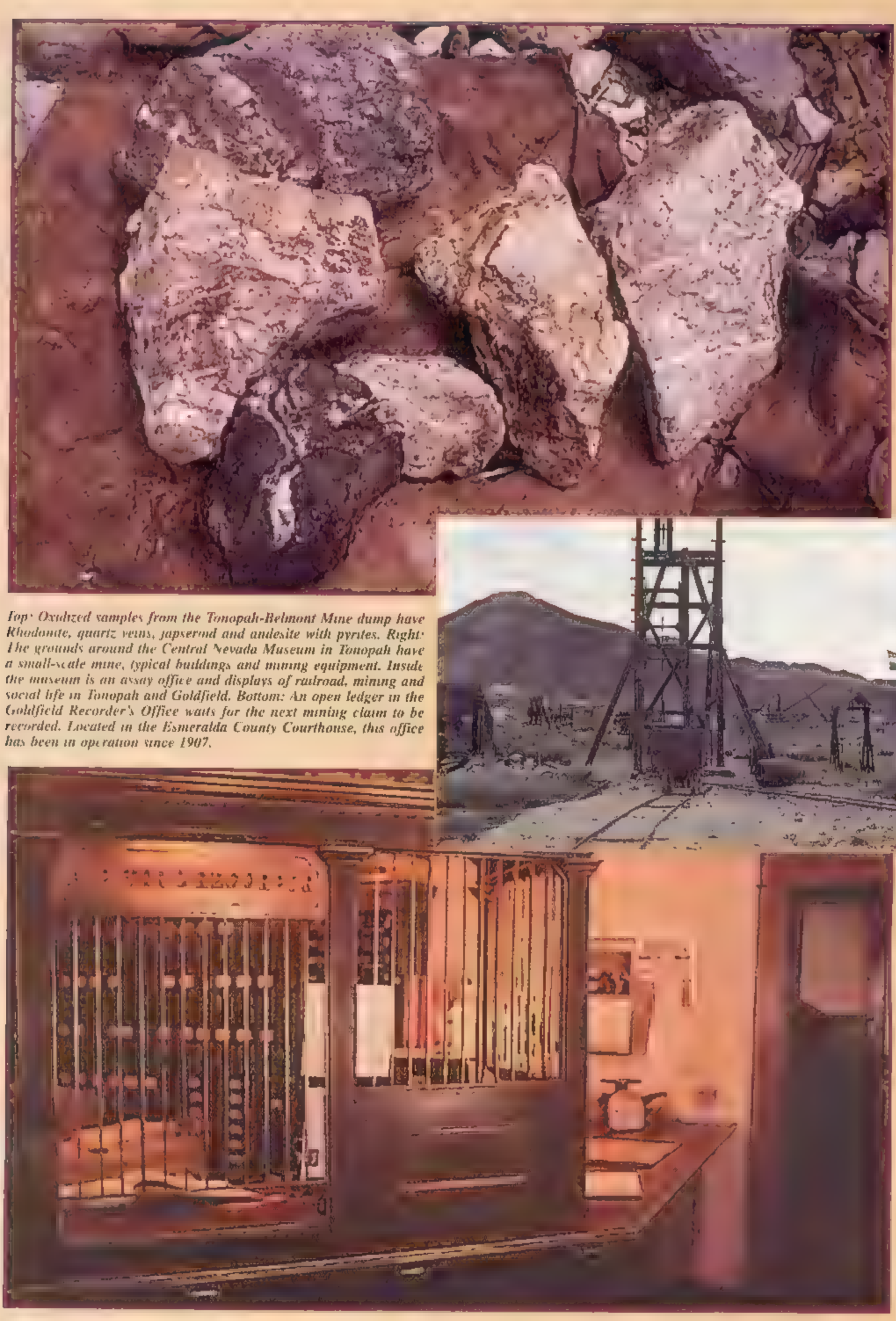


Top: Oxidized samples from the Tonopah-Belmont Mine dump have Rhodonite, quartz veins, jaspered and andesite with pyrites. Right: The grounds around the Central Nevada Museum in Tonopah have a small-scale mine, typical buildings and mining equipment. Inside the museum is an assay office and displays of railroad, mining and social life in Tonopah and Goldfield. Bottom: An open ledger in the Goldfield Recorder's Office waits for the next mining claim to be recorded. Located in the Esmeralda County Courthouse, this office has been in operation since 1907.

Tonopah/ *from page 29*

The discovery of Tonopah came about because Jim Butler systematically investigated the hills and was rewarded after years of effort. In an excerpt from Butler's writings was this quote: "I noticed quartz in everything: contacts, fossils, changes in shrubbery, animal or insect life, agate beds.

In fact, all were interesting and none passed unnoticed, more especially quartz, which is the home of my long years of search."

In this case, a wandering burro led Jim Butler to the outcrop. He was driving a buckboard with two burros when he camped at a small spring the Indians called Tonopah and one burro wandered off. He tracked the animal for three miles, finding it and a dark rock he thought was quartz.

This burly, good-hearted man was involved in prospecting from age 13. "Have seen six weeks at one time that no Human being were near me—nothing but the ever familiar Howl of the Lonely coyote. So accustomed to such a life, has made it almost by first nature to prospect."

He broke off 30 to 40 pounds of the rock, but an assayer threw the rocks away without even testing them. On his way back to his ranch, Butler picked up more samples and left them on the porch of a general store. Tasker Oddie, Butler's friend and, later, senator and governor of Nevada, thought the samples might have something and he sent them to another assayer.

News came back that it was rich ore, but Butler was away at his ranch at the time. Meanwhile prospectors, including the original assayer who threw away the samples, searched the area but couldn't locate Butler's find. Butler and his wife finally staked eight claims, along with Oddie and the storekeeper.

That first year mining was done on a lease basis with a 25 percent royalty going to the owners. Four million dollars in ore was taken out before the leases expired on January 1, 1902. Sacks of rich ore were stacked around successful operations before being shipped off to the nearest railhead at Sodaville. Tonopah became the supply center for prospectors, and the new camps of Rawhide to the north and Goldfield and Bullfrog (rhyolite) to the south were discovered between 1902 and 1907.

Lottie Stimler Nay left her teaching job in nearby Belmont to join the Tonopah excitement that first winter. Employed by the Butlers, she set up a "soup house" on the road to the mines, expecting to cook for 15 people. She ended up cooking for 80 men, scrambling to find enough supplies when winter blizzards held up the freight wagons. She wrote, "My efforts to make a fortune in Tonopah have proved futile, but of course everyone cannot be fortunate. It is the pioneers of every place who endure all the hardships, and smooth and prepare the way for those who come later. I have lived in Tonopah ever since, and have been an interested spectator of its wonderful and rapid growth."

I found a reference library at the Central Nevada Museum with bound copies of *The Tonopah Miner, Tonopah Daily Times* and other newspapers. Interviews with Nevada pioneers, files on Jim Butler and even videotapes are available for research. Viola pointed out Lottie Stimler Nay's story and set up a video on the new Tonopah Historic Mining Park for me. She also suggested where to go to find samples of Tonopah mineralization.

Like the Comstock of Virginia City, these near-surface veins of gold and silver are related to the circulation of mineralized solutions in a volcanic environment. They had a limited vertical extent, below which the ore was too low-grade to mine.

They were called "bonanzas" because of the rich areas of massive quartz veining which contained concentrations of silver and gold. However, unlike the fault-controlled Comstock, these deposits under Tonopah and Goldfield are related to calderas—volcanic domes with a deep-seated igneous source which caused ring fractures, explosive vent breccias and fissures through which hot, mineralized fluids percolate.

While many calderas are not mineralized, a few have the right conditions to produce rich deposits. The world class Round Mountain gold silver mine to the north is a collapsed caldera.

Tonopah is a beautiful town, with winding roads leading through older residential neighborhoods. Brougher Mountain southwest of town has a panoramic view of the main mining area between the main street and Mount Oddie to the north. Part of the Desert Queen Motel sits on tailings from one of Jim Butler's mines. In a vacant lot below Brougher's slopes I found a rich chunk of quartz with black silver sulfites in crustified bands. The silver-to-gold ratio here is about 100 to 1, with acanthite as the principal silver mineral.

Viola suggested I visit the abandoned dumps of the Tonopah and Belmont Mine half a mile east of town, off Highway 6—a likely place to find examples of Tonopah mineralization. I turned off the highway at Ketten Road and saw the concrete foundations and huge rock piles just ahead on a well graded dirt road.

Breaking open some of the black rocks revealed pink rhodonite, a form of manganese associated with epithermal veins. Other rocks had the yellows and oranges of iron alteration. Andesite was veined with quartz and altered to green chlorite with pyrites.

On the hillside overlooking the mine's foundations I had a picnic lunch, and then for "dessert" I wandered around the hillside, picking up mineralized specimens.

Quartz with irregular dark bands of ore minerals was localized in veins along the east trending Tonopah Fault. The productive zone was a 200 yard thick shell with its apex at the surface near the center of the town. The Comstock was the only larger deposit of this type in the United States, and it also had much greater gold production. The district produced $147 million with silver at 40 cents an ounce.

Every summer Jim Butler Days celebrate Tonopah's past with mucking and drilling contests, shootouts, a kangaroo court, events for kids, dances, cook-offs and historical programs. The Tonopah Chamber of Commerce has brochures and dates for the celebrations.

Similar to Tonopah, a deeply emplaced caldera about five miles in diameter is thought to be the source of Goldfield's rich ore. Goldfield was founded when an experienced Indian prospector brought gold-bearing rocks to Tonopah. Prospectors followed him to Rabbit Springs and found float gold nearby. By 1904 Goldfield began shipping rich ore, and soon brick and stone buildings were built. A railroad connected Goldfield and Tonopah to the main lines, and operated until 1947. A few of these historic buildings still stand as reminders of Goldfield's boom years. Mining peaked in 1910, with over $10 million being produced by the Goldfield Consolidated Mining Company. By 1918 major mining had ceased, although in the 1980s open-pit operations developed near-surface veins and microscopic gold and leached dump material.

In Goldfield, I picked up a map of historic buildings from the Esmeralda County Courthouse Recorder's Office and strolled around Goldfield's historic downtown. Allen Metscher, a long time resident of the area, took me on a driving tour. His grandfather died in a cave in in the Mohawk Mine, and his father and uncle died of silicosis from working in the Combination Fraction, the Florence and the Mohawk. "They would come out of the mines just white from the dust," he said sadly. He pointed out the old jail, swimming pool and the depot for the Tonopah Goldfield Railroad. On the low hills behind town green and yellow mine dumps of ore and waste rock are guarded by wooden headframes.

When I first approached Goldfield from the north, I visited the cemetery on the outskirts of town. A group of plain white crosses on a plot above the cemetery hinted at some disaster. "In 1908 the graves were moved during the night," Allen explained. "Passengers on the Las Vegas and Tonopah Railroad didn't like getting off the train next to the cemetery so the railroad got permission from the county to move the 70 bodies." Allen explained. From their resting place the early pioneers of Goldfield look out over the distant stone and brick buildings.

Little remains of the railroad except concrete foundations. A 1913 flood came

continued on next page

Tonopah/ *from page 31*

down off the Malpais Plateau and swept through the railroad area, scattering debris downhill for miles.

Goldfield continues to attract both honest and shady operators. We had driven by the 1905 Santa Fe Saloon and out Diamondfield Road, where the landscape was all typical of Western mining.

"A blind miner, Heini Miller, had a telephone wire running from the Santa Fe Saloon three miles to his mine," he told me. "He would hang onto the line to guide himself to his mine." Allen was happy to see that Miller's headframe was still standing over the abandoned mine.

We followed the Las Vegas and Tonopah Railroad grade south of town. "They never did build it north of Goldfield, but they kept the name. It runs alongside the Bullfrog-Goldfield Railroad here." He gestured at the rusty buttes and Joshua trees on the sagebrush-covered hillsides. "We ought to rebuild this old railroad and bring people out here, so they can see how beautiful Goldfield is. Just like a Hollywood Western."

I had to agree.

Allen got interested in old railroads while working near the Nevada Central Railroad below Austin, Nevada. He walked the railroad grades around Goldfield, picking up pieces of the old rail to make a display for the Central Nevada Museum in Tonopah.

"Stop!" Allen suddenly commanded. He bounded out of the car and began picking spiky stems from a green bush. "Squaw tea," he explained. "I fractured my arm and one of my Indian neighbors told me this was good for aches and pains." I took a stem and began chewing it. "It's bitter," he warned me, "but you're not hurting enough if you can't stand it. Mormon tea, some call it *Ephedra nevadensis*."

Specimens of the dark argentite and gold crusted ore of Goldfield lent itself to high grading. Hidden pockets in miners' overalls, special boot heels and pick handles, and lunch boxes were some ways this ore made its way to assayers' offices.

These were exquisitely beautiful samples of quartz bands with frills of gold against the darker argentite. Most of the gold is native, though a small amount occurs as a variant named goldfieldite. Tiny specks of gold cluster thickly enough to appear as a band. Some specimens have an inner zone of free gold and quartz covered by a reddish gray copper arsenic mineral with an outer layer of pyrites. On other specimens the gold forms a crust on quartz and bismuthinite. The common enclosing rock is flinty quartz which has replaced the volcanic dacite and andesites. (To see rich specimens, visit the Keck Mineral Museum at the University of Nevada in Reno, written up in the June 1998 issue of *Rock & Gem*).

While working in the Wheelbarrow Stope of the Clairmont Mine, Allen's father and uncle, George, ran into some high-grade after a blast. "Dad said that the streak of gold looked like a yellow streak of lightning traveling across the roof of the drift," Allen exclaimed.

Using a file he happened to have, his father pried loose some of the rich ore and took it home in his lunch box. "He sold it to a local assayer for $800," Allen told me. "Then a new helper was assigned to their shift, and they were laid off the next day."

In an ore-deposits class, one lab had us examine specimens of greenish-yellow vuggy and brecciated quartz samples speckled with pyrites from Goldfield. Their surfaces were covered with thin films of drusy quartz. The particular "dusty" look of these altered rocks comes from the alteration of feldspars into alunite and clay. Wide areas show this alteration—again, a key to the presence of mineralization somewhere within the alteration envelope.

The widespread alunite alteration from acid solutions has led to the name of "acid sulfate" for this type of deposit where the circulation of sulfuric acid played a critical role.

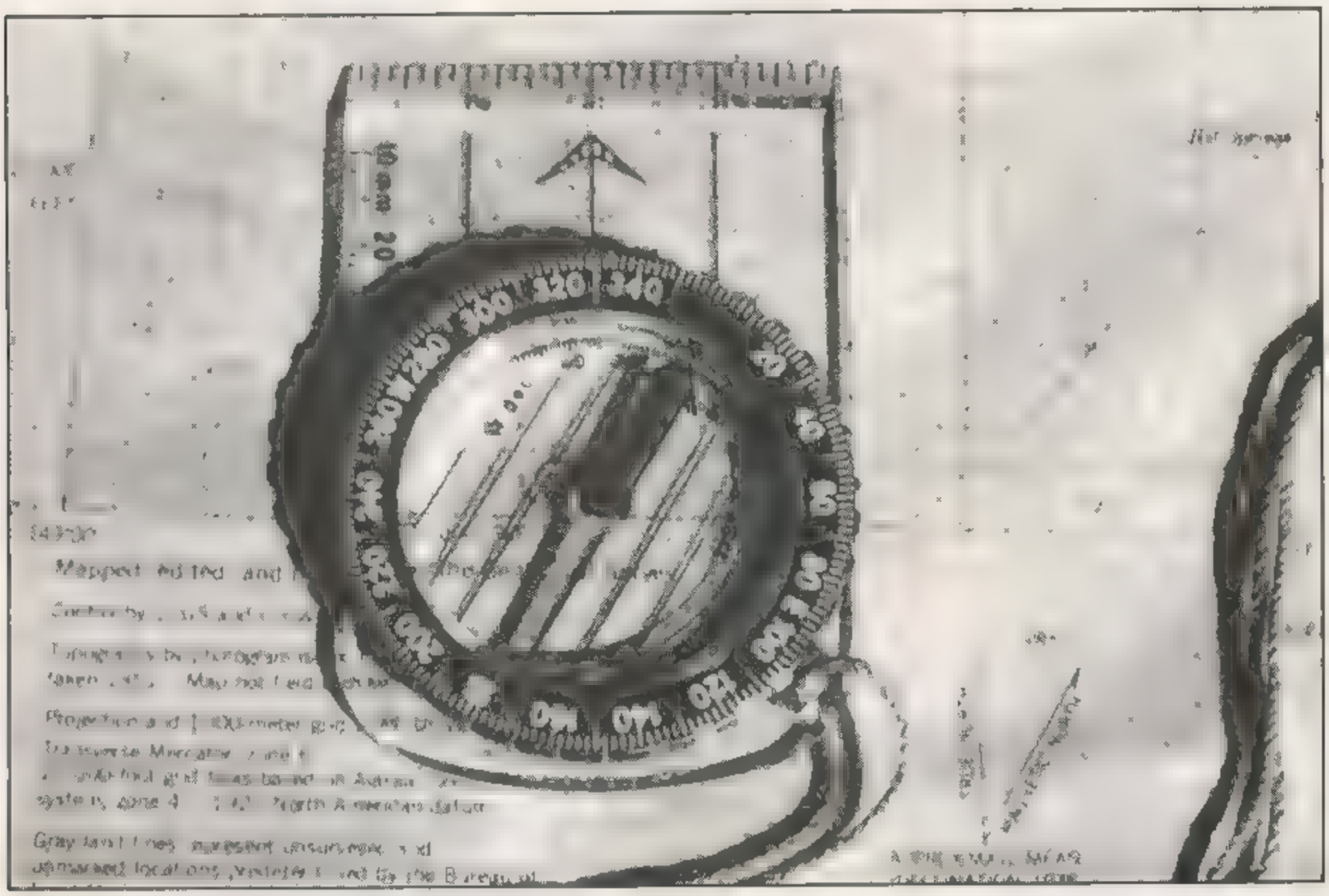
Walk anywhere around the mining areas of Goldfield and pyrites will be the most conspicuous mineral. The ground is saturated with pyrites. And many of the rocks have a plain, fine-grained, soft texture from their alteration to alunite and clays.

After a look into Goldfield's history, I slowly drove the dirt roads and old railroad grades leading out of town. Vast mounds of low-grade ore are stacked for eventual processing. Many of these are oxidized and crumbly. Occasionally, in the ditches and back roads, are the resistant quartz specimens which fell off an old ore wagon, or came to their present location by sheer carelessness. With a rock hammer I tested the rock to see if it had pyrites, gray sulfides, and was fractured and brecciated.

The Goldfield Consolidated Milling and Transportation Company Railroad hauled ore a mile to the north, where the old foundations and acres of crushed tailings can be seen. The tailings are claimed, but the railroad grades form natural walking routes for those looking for a piece of Goldfield high-grade.

The towns of Tonopah and Goldfield were once the major hub of activity in central Nevada. Railroads hauled rich shipments of ore to smelters and brought passengers to these busy cities in the high desert. Residents are proud of their history and are more than willing to share it with others. The Museum, historic buildings and mines provide an in-depth look at what life was like in these gold and silver camps. And when you enter through the Mizpah Hotel's massive oak and brass doors, you get the feeling you are following in Jim Butler's footsteps.

STAKING YOUR CLAIM



by Roger McPherson

You are out taking a day hike in a wooded valley when you part some brush and find chunks of white feldspar and quartz crystals, indicating a pegmatite lies nearby. Or perhaps you see nuggets in your pan while prospecting in a remote creek. Could you correctly stake out a mining claim, check land status and record your find so you could retire on its income or sale?

Claim staking is a simple process which every rockhound and recreational hobbyist should understand. Every summer, I stake dozens of claims in my quest for a big deposit. In this article, I would like to demystify the steps needed to stake a mining claim.

Ryerson recounts one case, in *Gem Trails of California*, in which he found a pegmatite in Southern California and, not having a pencil or paper, had to leave the site. When he returned, it had been claimed.

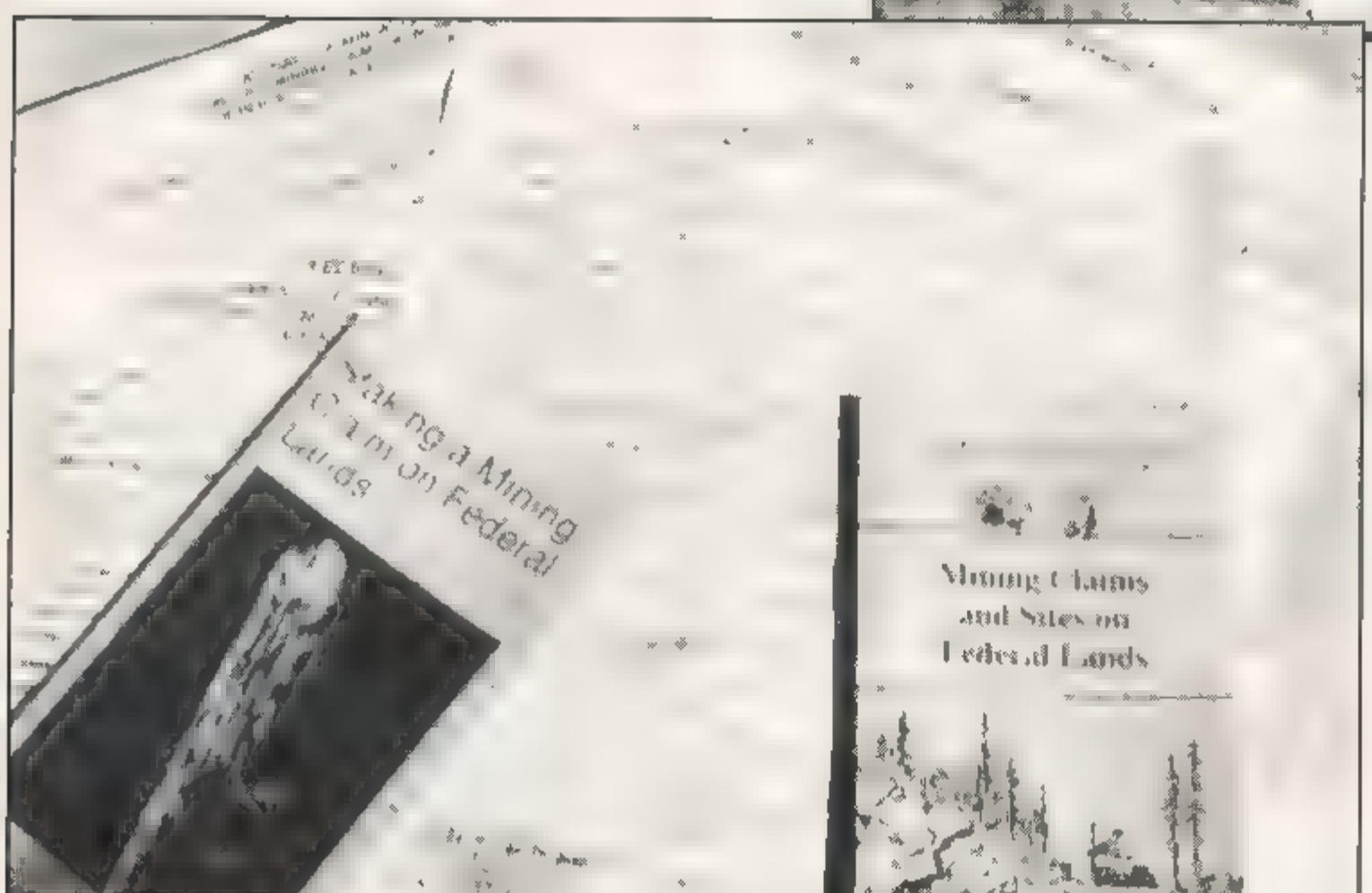
His story gives a clue to the basic materials needed for staking a claim: paper and pencil. A claim has to have a notice posted on its northeast corner with a sketch of the claim (see sample), description of its boundaries, the date of the discovery, and the claimant's name and address. A plastic bag, jar or film canister is usually used to protect the claim notice. The boundaries of the claim must be marked, and brass monuments or wooden posts placed in all four corners.

Federal claims require a discovery post or cairn be placed where the actual discovery was located.

A compass (and an understanding of the declination for each area), topographic map, flagging and an ax to cut corner posts make up a claim-staking outfit. I used to pace off distances, but now I use a "hip chain," a counter on my belt that uses a thin thread tied to a bush or tree to measure the distance walked. To make a straight line, I set my compass with a heading (for state of Alaska claims (where I live) north, south or east, west).

"Orienteering" compasses have an arrow which is set to the desired direction while holding the magnetic needle on magnetic north. In my area, declination is 30 de-

The Vital Step For The Successful Prospector



The author is shown above checking a claim post. At left are helpful claim-staking publications and forms. On opposite page is orienteering compass with declination set.

grees east, so I turn the direction arrow 30 degrees to the west. It now points true north when the magnetic needle is lined up with magnetic north.

Federal Claims And State Claims

In most states the land open for mining claims is federal land under the control of the Bureau of Land Management (BLM). On federal lands, claims are either lode (1,500 feet by 600 feet) or placer – a maximum of 660 feet by 1,320 feet or 20 acres. Federal claims are situated by the discoverer to cover the vein or creek, whatever its orientation. In Alaska, about a third of the land is owned by the state, which allows claims (no difference between lode or placer) to be 40 acres or 1,320 feet by 1,320 feet in north-south and east-west directions.

Not only is Alaska more generous with the amount of land in each claim, but its claim fees are also less expensive. Each federal claim requires an annual payment of $100 plus recording fees, each Alaska claim has an annual $20 fee, plus recording fees. Recording office fees are separate from the mining fees and are a one-time cost.

The annual Alaska payment remains in effect for the first five years of the claim, and then goes up to $40 a year, and eventually tops out at $100 each year. The incremental schedule for Alaskan claims allows a prospector or miner time to assess the deposit, develop it or interest a company in developing it.

In addition, the state of Alaska sends each claim owner a list of his or her current claims shortly after August 31, the end of the mining year, with the option to cross out any claims the owner wants to abandon before paying the annual fee.

While doing volunteer work in the State of Alaska Division of Mining Office last spring, I helped file hundreds of claims. Recent discoveries and renewed interest by mining companies and individuals have resulted in massive stakings. This led to a pile-up of paperwork which a few of us volunteered to file away. Eric, a former expert with the division, was there to coordinate our work and give expert counsel with knotty problems.

continued on next page

Staking/ *from page 35*

Mining companies now hire him to research land ownership in areas they are interested in staking. KT, a former BLM employee and fire dispatcher, was also helping out. Eric promised to train us in the finer points of land-status research as part of our volunteer time.

"What about these claims?" KT showed a batch of papers to Eric. "They were staked on August 30th. Shouldn't they have waited until September first?"

"They wasted a lot of money paying for the last two days of the mining year," Eric told us. "They probably think they've already paid for the next mining year. These claims are probably open again."

"I had a similar experience last summer," I told them. "I was worried someone would stake a vein I found, so I put in the claims in July, even though I would have to pay the same fees again after September 1st. It was worth the peace of mind."

Describing Your Claim

The legal description of the claim ties it down to a particular spot. Topographic maps have township and range numbers shown along the sides and, within each township, the 36 sections are numbered. Claim forms are available with spaces for all of these descriptors. Copies of Alaska's claim form—useful for federal claims if you scale your claim down to the 600 feet by 1,500 feet size for lode and 660 feet by 1,320 feet for a placer claim—can be obtained from Department of Natural Resources, Public Information Center, 3601 C Street, Suite 200, Anchorage, AK 99501. For an informative booklet on "Mining Claims and Sites on Federal Lands" write to the BLM, 1849 C Street NW, LS-510, Washington, D.C. 20240-0001 or phone (202) 452-0350.

In Alaska, the legal description of the land begins with the meridian, the zero point from which land in that area is counted off. Alaska has five meridians, so a land description which omits the meridian may be in any one of five places. The Fairbanks Meridian has a center point in town, and numbers townships north and south, and ranges east and west. On the edges of a topographic map these are shown, for example, as T2N for Township two north and R4W for Range four west.

Each township is six miles on a side, and is divided into 36 sections, each 1 mile square. T2N starts 6 miles north of Fairbanks and extends 12 miles farther north. Near cities, the township lines are cleared and can be seen stretching north-south and east-west. Brass monuments are placed at the corner of each section and quarter-section (halfway from each section marker).

It's useful to review distances in a mile (5,280 feet), half mile (2,640 feet), and quarter mile (1,320 feet). Remember that the Alaska claim is 1,320 feet on each side, and the federal placer claim 660 by 1,320. Therefore, a state of Alaska claim is one-quarter of one quarter (one/sixteenth) of a section, or 40 acres. This would be written as the ¼ of ¼ section 10 (out of 36 numbered sections), T2N, R4W, Fairbanks Meridian.

Each section is divided into 16 quarters—four large ones and four quarters inside each larger one. Each quarter is described using north-south and east-west directions.

Begin with the claim itself. Is it in the northwest, northeast, southwest or southeast quarter of the quarter section? One of the easiest claims to describe is the one in the upper right hand corner. It's in the northeast quarter of its quarter section. In the section, it's in the northeast quarter. This is written as "NE ¼ of the NE ¼ of Section 10, T2N, R4E, Fairbanks Meridian."

Take a minute to figure out the description for claims in the other areas. The answers are at the end of this article.

Since federal claims are one-half the size of an Alaskan claim, a legal description would add "north ½" (or "south ½" or "east ½" or "west ½") of the NE ¼ of the NE ¼, Sec. 10, T2N, R4E, Fairbanks Meridian. This description would give you a placer claim 660 feet by 1,320 feet. Most creeks don't run exactly east-west or north-south, so you may just list all the quarter sections in which the claim is found.

Practice describing a place on a topographic map. My first claims were inaccurate, and I often come across claims in the woods that are lacking exact descriptions.

Paper Staking

An accurate sketch and description at the northeast corner, clearly marked boundaries and a valid mineral discovery are required by law, but this is what many mining claims *lack*. Some people look at a map and feel that they don't need to go out to the place before staking a claim. They make out an accurate claim form, send or take it to the BLM or state office, pay their fees, and record the claim at the recorder's office. There's nothing on the ground, no notice in the northeast corner, and no flagging or signs to indicate the boundaries of the claim. Unless a person checked the land-status plats (diagrams), he or she wouldn't know the area was claimed.

Mining laws require that claim owners go out and check their claim lines on a yearly basis. Many don't do this and they forget exactly where their old markers are. The other extreme is the person who blazes each tree with an ax, leaving scars that will always be there. I use pink surveyor's flagging to mark my lines, and put up the required 4-foot by 4-foot post at each corner.

I also put up a sign where people will likely enter the claim area. Berry pickers, hunters, fishers and hikers can use the

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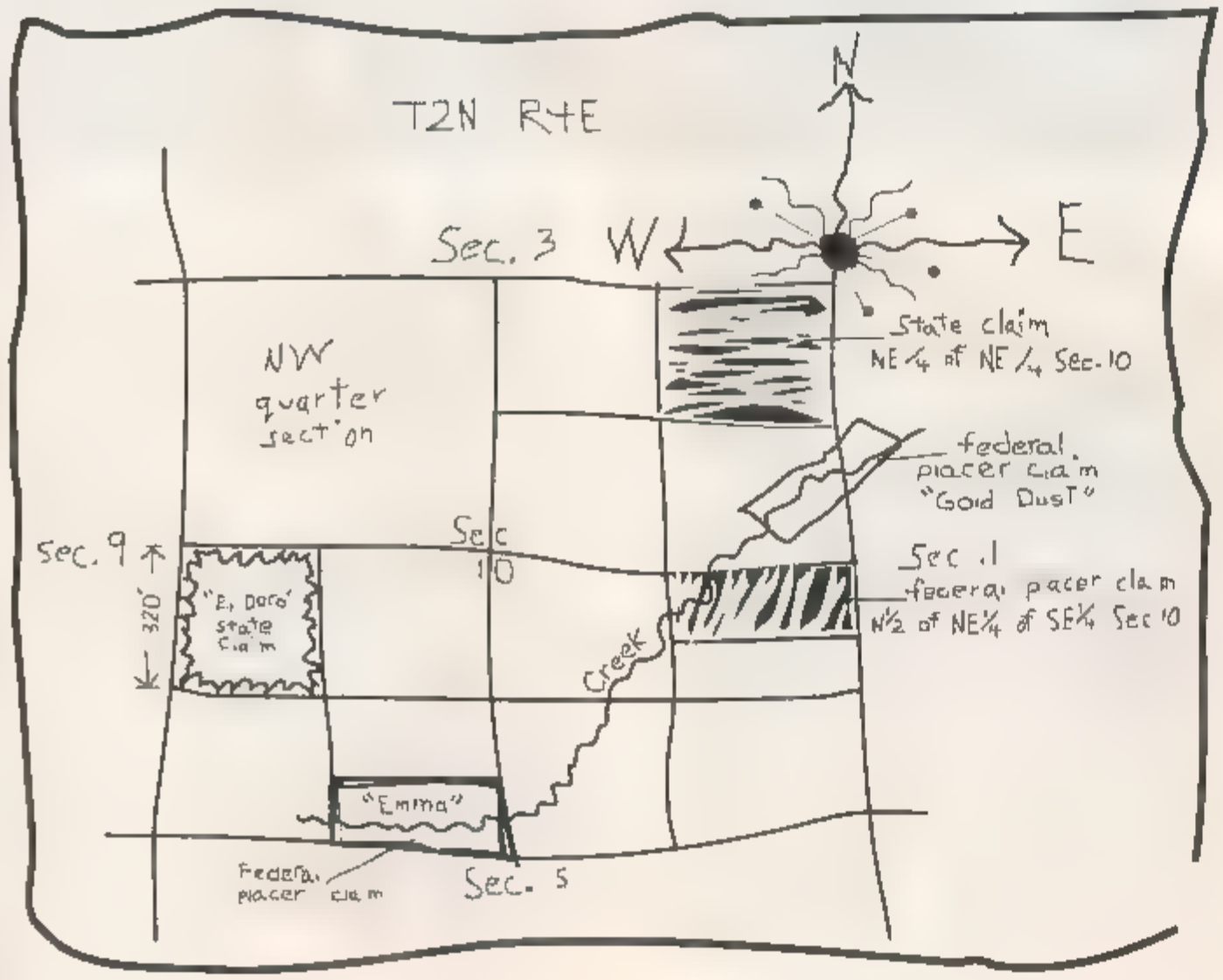


Staking/ from page 37

mining claim—only I have the right to the minerals on it. If I abandon the claim, I walk back along the lines and take out the ribbon, leaving nothing behind.

"My very own mining claim!" I hear people say, a gleam in their eyes. "I'll build a summer cabin and have the perfect retreat." But this practice has been stopped. A mining plan must be submitted for approval before any development takes place. Any disturbance must have a reclamation plan.

Every winter I do an annual mining plan for the state of Alaska and pay a $100 fee. This plan is sent to many agencies to check whether I meet wetlands guidelines and satisfy fuel-storage laws or have access problems.

People with the State Division of Mining schedule inspections and discuss any problems they see in my plan. The Army Corps of Engineers is also involved when I am dealing with wetlands.

Land Status

Before going into an area to look for minerals, a search of land status will show who owns the land and what restrictions may be on it. The BLM has public rooms containing information on land status and federal mining claims. The BLM's system uses townships and ranges, with ranges being the key identifier. Normally, we talk about township and range to locate property, but the BLM reversed this to range and township in its records.

Many mining discoveries were made when the federal government owned the land, and many of these federal mining claims are still active. Some became patented, while others received a case file number but were not patented. These records have to be researched to find out if a federal claim is still active or is open for staking.

On a broad scale, the USGS has land-status maps done by the BLM ("surface-management status"), which give land ownership for some Western states. Many lands are closed to mineral entry. A little research will show which lands are open for claim staking. In Alaska no one can stake claims in national parks, wildlife refuges, wild and scenic rivers or state recreation areas. I look for open federal land, and state land which isn't closed to mineral entry.

Recording And Annual Labor

From the time of my discovery and staking out a claim, I have 90 days to record it. This is a time when an unethical person might find my notice and discovery, overstake me and get to the recorder's office. They might backdate their claim and say I was claim-jumping. Getting to the recorder's office soon after a discovery is a priority. The official date that the recorder puts on a claim can't be disputed in court.

Another view holds that waiting until just before the end of the 90-day period and then filing prevents someone from seeing your claim become public, and closes off the option of backdating their claim. I have been overstaked, so beware of this loophole. Unfortunately, going to court is the only way such disputes can be resolved.

To keep your claim active you are required to pay the annual fee and, in addition, do $100 worth of annual labor for each claim. (This is the same for both federal and state of Alaska claims.) An Affidavit of Annual Labor gives a legal description of the claim, the work performed (assays, trenching, testing, etc.), and the total amount spent. A large outlay in one year can be carried over to cover future years. The affidavit has to be notarized and sent in within 90 days of the end of the mining year. Blank Annual Labor forms can be obtained from the BLM or state of Alaska offices, and these provide spaces for the required information.

During my volunteer work, as we sat around filing masses of claims, I noticed there were the "mountain claimers" and people who only filed one or two claims. Most deposits are not that extensive, but as long as you have a mineral discovery on every claim, you are allowed as many as you want. An untouched, gold-bearing creek might need 10 or 20 claims to cover the placer deposit. This runs into a lot of money for fees, and Herculean efforts to mark every claim properly. Then, each year, annual labor affidavits have to be filed.

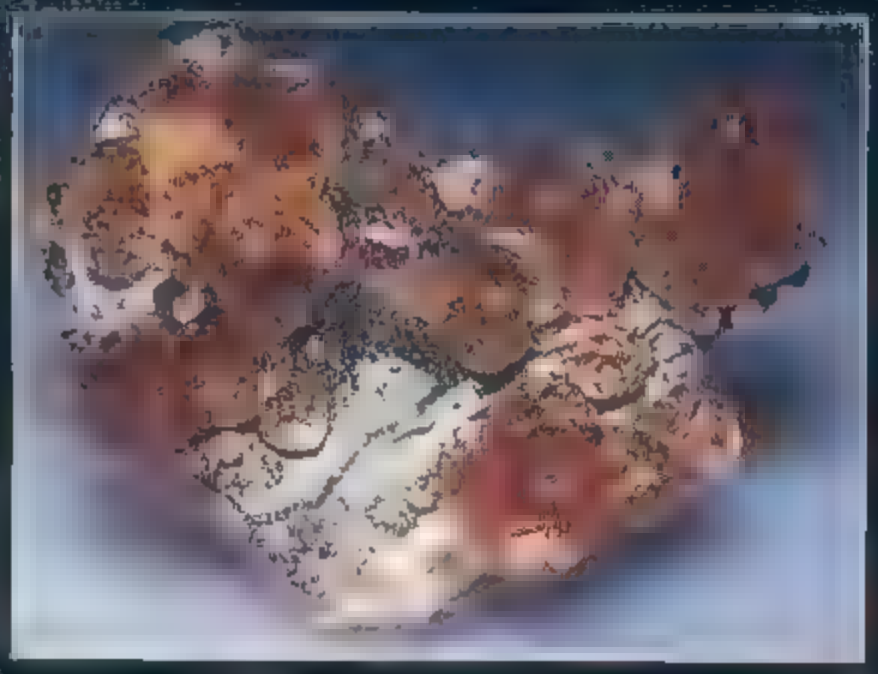
In the old days, miners got their discovery claim and one more on the creek. Since this is no longer the case, each person has to decide how much he or she wants to put into claiming. A company generally wants a large claim block to protect its interests. When the Fort Knox Gold Mine near Fairbanks was discovered, small claim-holders in the area did well selling their claims as the mine consolidated its claim block.

The mineral discovery a person makes is the beginning of an exciting new story. Some of these tales end sadly because the discoverer didn't know how to properly stake the discovery and maintain the claim over a period of time. People who spend time rockhounding should consider taking a few blank claim forms along, in case a discovery is made. Knowing land status is the second step in this process. Finally, the ability to use a topographic map to describe the location of a discovery and some basic compass skills are necessary.

A successful prospector is anyone who is prepared to stake a claim, has an understanding of minerals and spends time enjoying the great outdoors.

January's Birthstone

Garnet



It Is The Birthstone With The Most Complex Of Personalities

The asbestos quarries of the east are noted for choice grossular (Hessonite) garnets. This one is from the Jeffrey Pit, Asbestos, Canada. (Evan James collection)

Rare and gemmy is this Spessartine garnet from Marianfluss, Namibia. (E. John Bartlow collection)

by Carol Farrar

Lucky are you who were born in the month of January. Your birthstone, garnet, offers a huge variety of colors, is extremely durable and can be relatively inexpensive.

Some garnets, tsavorite for example, can cost as much as diamonds or more. Others, such as almandine, may be inexpensive and, when properly cut, sparkle and glow in your jewelry.

Birthstones have been with us for centuries. The prevailing idea is that the Breastplate of Aaron, the High Priest of the 12 tribes of Israel, contained 12 gems. Prior to that there had already been a belief in the relationship between the 12 constellations and the 12 tribes. It was not until Josephus in the first century A.D. and St. Jerome in the fifth century A.D. confirmed this belief in their writings, connecting them with the breastplate.

However, the actual evolution of birthstones had no such religious connection. Rather, it had a commercial root in 18th century Poland. It seems the idea of convincing people that certain gems had useful properties appealed to jewelers, who would benefit from the sale of those gems. Be that as it may, garnet has evolved as the premier stone for the month of January. This is sometimes supplemented with a newer, rare, and usually expensive gem, tanzanite, a variety of zoisite.

A classic Dana locality, the Pitts-Tenny quarry, Minot, Maine, produced this choice grossular variety Hessonite.

While tanzanite is new on the gem scene, zoisite is well-known. You may be familiar with the bright green stone associated with a black amphibole from Africa that sometimes encloses very large hexagonal crystals of red ruby. This is a very popular carving stone. The green material is zoisite, which was not known in gem form until the discovery of tanzanite.

The remarkable thing about tanzanite, which was discovered in 1967 and is still being mined near Arusha, Tanzania, is its color: bright blue. And it is an unusual gem because, when turned slowly in a bright light, a crystal will change color, not once but twice—exhibiting first bright blue, followed by a pale lavender and a third almost colorless appearance. Still other tanzanites show the good blue, fine purple and paler green when rotated.

This property is called trichroism. Many gems show more than one color when slowly rotated in light. Gem tourmaline, epidote and a host of other minerals show this chameleon-like property with the generic name of trichroism. But garnets show no such color change, as garnet crystals form in the isometric or cubic system that does not have an internal atomic structure, which may affect light as in hexagonal minerals.

continued on next page

Garnet/ *from page 53*

To be accurate there isn't a mineral called garnet! Garnet is, in fact, a group name and includes a considerable number of varieties based partly on color but mainly on the complex chemistry of the group. Because garnets are chemically complex, they are difficult to categorize easily. Their complexity is due in part to the fact that atoms of different elements, in this case iron, chromium, vanadium or manganese, can interchange within a garnet structure because they are similar in size and electrical condition. Thus, they may substitute other elements on the garnet's structure. For example, a garnet may exhibit the chemistry of one species, like a mandine but also some of the chemistry of pyrope. Hence, pure forms of each are called pyrope and almandine. But the "mixed" form is called a mandine-pyrope.

John Rouse, in his useful book *Garnet*, lists no less than 21 separate species of garnet, plus a handful of variety or trade names. I doubt any other birthstone can even come close to offering such variety, all of which are based on chemical makeup. Gem garnets are judged mainly on the variety of colors and tints that are available. If garnet is your birthstone, you have the broadest number of choices of any birthstone.

For color, here are the almandite/pyrope red garnets. The grossulars are another group of garnets, including emerald-like tsavorite and hessonite, which can range from green to cinnamon in color. A third group of garnets includes demantoid, a rare but lovely green gem, and andradite, the chameleon of the garnet group, are all aluminum oxy silicates, pyrope, almandine and spessartite. These also contain magnesium, iron or manganese respectively.

Overall, the colors seen in the garnet group range from bright red to green, pink, brown, cinnamon, orange, yellow, even black! Again, within these colors there are variations, so you can find garnets that are orange red, violet red, dark red, brownish red, green, yellow-green, emerald green, orange brown, yellow orange, even colorless or black. What more could you ask of a birthstone?

These colors are due to transition metal ions caught up in the atomic structure of the garnet. Almandine and pyrope can be colored by iron ions, though pyrope may owe its red color to chromium. Iron of a different atomic arrangement makes andradite yellow-green but it may also be black, brown or yellow. These colors may result from the action of iron or an interaction of iron with titanium. The valuable rich-green tsavorite's color is triggered by vanadium, while manganese ions give grossular its orange color. Manganese also colors spessartine while chromium triggers uvarovite's green color.

It should be obvious by now that there are so many variations in color and garnet varieties that it is nearly impossible to list every agent and variety. For instance I haven't listed rhodolite or demantoid, obscure varietal names of the above listed garnets, yet both are highly desirable gem garnets due to their color.

This broad array of varieties and colors in the garnet group suggests a variety of occurrences, and rightly so. Some garnets, like almandine, occur mainly in metamorphic rocks which have been heated and pressurized to such a degree that their internal structure is rearranged and almandines were able to form. Others occur in pegmatite deposits. Still others are found in contact metamorphic zones. Again, because of garnets' proclivity to mix and match their chemistry, they may be expected in almost any geologic or metamorphic occurrence.

Aside from color, garnet is a proven gemstone because it has a high level of hardness and, so, is quite durable. Many garnets are too dense to transmit a lot of light but those which are quite clear and brilliant are very attractive. With a hardness of 7 on the Moh's scale, garnet can resist the scratching of quartz sand and other common abrasives. Therefore, it can be used in rings, necklaces, bracelets, even breastplates.

Garnet has one of the longest histories of any gem. It was used in Aaron's Breastplate long before the time of Christ. The earliest writings about minerals mention red garnet, most likely almandine, as it is quite common. It was referred to as a carbuncle.

Rich red garnets were said to be "fiery" and the Greeks described red garnets by two words meaning "fire" and "I see," alluding to the fiery flash of red coming from within the gem. From this we derived the term pyrope. The term almandine comes from a locality, Alabanda, in Asia Minor. Spessartine was first reported from Spessart, Bavaria, while grossular refers to the Latin word for gooseberry-green. The final two, andradite and uvarovite are named for a Portuguese mineralogist, Adrada e Silva, and a noted collector, S.S. Uvarov, who lived in Russia where uvarovite was first found, and is still being mined from river gravels.

For collectors, garnet is one of the easiest minerals for the beginner to recognize. This is due to its almost universal crystal form, the 12 sided dodecahedron. Garnet forms in the isometric or cubic system but cubes of garnet are virtually unknown, as is the octahedron.

There are, of course, more complex forms based on the dodecahedron. The trapezohedron has 24 faces, while additional faces make combinations of the two common forms.

Garnet, like all other gems which were found and used centuries ago, had a number of beliefs developed about it. It was thought, for example, to diminish anger when worn. It was thought to reduce fever in the ill, as well as guard the wearer against poison and being struck by lightning. It was also thought to be the symbol of friendship and fidelity, making the wearer honest and trustworthy. And because of its common red color, it was thought to improve the health of the blood and organs of the body.

When you buy a garnet you might try the ancients' test to determine if it is genuine. Wear it, then smear your body with honey. If wasps and flies are attracted to you the gem's a fake! Or so the saying goes.

Of some interest is the lore attached to gemstones in the ancient Sanskrit beliefs of India. These credit a supernatural evil demon, Vala, as being the source of all mystical gems. Vala was once the tyrannical ruler of the universe, but he was tricked and captured by the demi gods of the Universe. They dismembered him and, where his body parts landed on earth, gem deposits were thought to have formed! Garnets resulted when Vala's toenails landed on earth. The fragments were seized by the snake gods and scattered over the earth. Each fragment became a garnet deposit.

These led to the astrological characteristics of garnet. It is the gem of the Sun, the constellation Leo, Sunday and sunrise.

Ancient Sanskrit is only one source of garnet lore. Legend has it that garnet was used as the source of light in Noah's Ark during the dark days of the Great Flood.

And there are other beliefs credited to garnet, particularly the red varieties. For example, George Kunz recounts a number of ways in which garnet is given status. It is the gem for a married couple's 18th anniversary. It is the gem of the 11th hour of the day. It is the Zodiacal gem of the constellation Aquarius, though in other writings it is assigned a different constellation. The original Arabic designation was to the constellation Scorpio, while other cultures assign it to Capricorn. Because of its red color, garnet is thought to be the heart of the constellation Leo.

Here in the United States garnets are among the most easily collected and available gemstones. If you ever get to Alaska, you might try your luck at collecting textbook crystals of almandine near Wrangell, where it occurs in a gray schist.

I cut my rockhounding teeth on collecting in Roxbury, Connecticut. My first real field trip was there, and I literally filled my pockets with loose dodecahedral almandines as I walked along the dirt road leading to the outcrops of schist. This locality was worked in the 19th century for garnet to be used as an abrasive sandpaper.

Because of the Roxbury deposit, Connecticut is one of two states that has designated garnet as its state gem. Utah, home of the famous star garnets, is the other. Here the number of occurrences of star garnet are numerous. There's Ruby Gulch, Emerald Creek, Pardue Creek and more.

If you have an interest in Utah garnet collecting, you might start by reading John Sinkankas' superb work, *Gemstones of North America*, considered by many as the bible for American gem collectors. With the included map and descriptions, John's book puts you within reach of Utah's star garnets. A selected bibliography also provides you with a good reading/reference list on the subject. Clearly, it would be fun to collect your own January birthstone, garnet.

American ingenuity was pushed to its limits when the cry of "Gold" came from the prospectors on the American River. Tools and material were scarce, and mining gear had to be crafted from what was on hand. This sluice box was set up in Auburn Ravine.

GOING FOR THE GOLD

The Colorful Mining Gear Of The Argonauts

by Skip and Norma Ingalls

"Gold! Gold! Gold from the American River!"

It was May 1848 when Sam Brannan ignited gold fever in San Francisco. Waving a bottle of nuggets, he left turmoil in his wake. At the time, no one recalled that the publicity stunt was a plan to draw potential customers to a store he owned in New Helvetica near Sutter's Fort. As soon as Brannan had learned of the gold discovery, he bought up every spade, shovel, pot, pan and wooden bowl between New Helvetica and San Francisco. These goods were sold at "extortionate prices," earning Brannan a fortune. By mid June, however, Brannan's newspaper suspended publication because its staff had quit, leaving for the goldfields.

Almost all of San Francisco's male population soon headed for the Mother Lode. Most were poorly equipped and had no knowledge of prospecting methods. At first, only nuggets were picked up or pried out of

The Argonauts came from all walks of life, and some were lucky enough to walk away with fortunes. At a good site, 2 ounces of the precious metal was considered an ordinary yield for a day's work.

bedrock with knifepoints. There were no proper gold pans. (The design we know today developed with use and experience.) Even baskets woven by local Miwuk tribes were used to separate light material from gold-bearing blacksand. The magnetite sand was simply spread out on rocks, left until it dried, then blown away to expose the heavier flakes and small nuggets.

James S. Brown, who was employed at Sutter's Mill when James Marshall picked up the first pieces of gold, told the story in 1894. "An Authentic History of the First Find With the Names of Those Interested in the Discovery." Having some knowledge of testing gold, he first bent it with his teeth, then flattened it with a hammer on a workbench. Wanting to be 100 per cent sure before he declared it the real thing, he placed the flattened lump on the blade of an old shovel, which he stuck into blazing hot manzanita coals. He knew the Mexicans used this hard wood to smelt

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their gold and silver. The shovel up was soon gold plated.

Brown went on to detail some of the methods used to recover placer gold.

"... the search for gold was commenced in earnest. With jack, butcher, and table knives the search was made in the crevices, after stripping the soil from the bedrock with pick and shovel. Next, we conceived the idea of washing the sand and small gravel in time [tin?] pans, but these were scarce and hard to get hold of. Alexander Stephens dug out a trough, leaving the bottom round like a log. Filling that with sand and gravel that we scraped off the bedrock, he would shake it, having arranged it so as to pour or run water in on the gravel, finally he commenced to rock the trough, which led to the idea of a rocker, which caused the gold to settle at the bottom, and he had it arranged on an incline so that it would naturally not only work to the bottom, but to the lower end of the trough, then at short intervals he would turn it into a tub of water, and at night it would be cleaned and weighed on a pair of wooden scales that he also made, using silver coins for weights, counting the silver dollar equal to one ounce of gold. The rocker above mentioned led to the renowned gold rocker, I am under the impression that Stephens did make the first rocker ever used in California. We made buckskin pouches or wallets to carry the gold in, it was not dust, nor yet nuggets, but small scales.

"The next and last process that we used in gathering was to spread a sheet on the sand beach of the river, placing some big rocks on the corners and sides to keep it well stretched, then fill the rich dirt on the upper edge, then throw water on to wash the dirt down in[to] the river, leaving the gold on the sheet, occasionally taking up the sheet and dipping it in a tub of water, thus using the gold off the sheet into the tub, and at night clean up our day's work, averaging from $.2 to $15 per hand. Our best paying dirt was carried on our shoulders from Dry Gulch all the way from 15 to 60 rods, to where we could find water to wash it with."

Other prospectors used an early method of "dry washing" their blacksand. They let it dry on a blanket, then four men would hold the corners and toss the dry grit into the air, letting the wind blow it away, again hoping to hang onto enough gold to make the effort worthwhile.

Another man credited with making the first rocker used in California was Isaac Humphrey. Shortly after James Marshall discovered gold, one of John Sutter's employees sent a sample to Humphrey for testing. After verifying that the discovery was, indeed, gold, he slipped away to the American River, where he used an improvised rocker design that he had seen in use during another gold discovery back east.

Imagine the intense heat of the California foothills in July of 1848. Yet, every river and creek, every gully and canyon swarmed with men at work in the sun's full glare. They washed for gold—some with tin pans, some with closely woven Indian baskets, but most soon used the crude machine resembling a baby's cradle.

They had little concern for who was the first to use it, as long as it was effective. Built on rockers, with a coarse grate or sieve across the head, it was open at the foot so the water could run through. The bottom was rounded, with small cleats nailed across it, creating riffles to catch the gold.

"Rocking the cradle" required four men. While one dug in the streambank, another carried the gravel and dirt to the cradle, dumping his load onto the grate. The third worker violently rocked the wooden contraption by means of a handle on the side of the box, while the fourth dipped water from the stream, pouring it over the gravel.

These crude rockers were improved with longer and more efficient sluice boxes, about six to eight feet long, which, in turn, led to the "long tom." Basically a high-performance sluice box, the long tom had a constant feed of water either from a flume or diverted stream flowing directly into the box. Dirt was shoveled in and stirred, causing the heavier gold to fall through holes at the end into a riffled box below. Runoff water was usually diverted back into the stream. It was reported that a party of four men, using this method in a reasonably rich area, could average $100 per day.

An 1848 report from Colonel Richard Barnes Mason to the adjutant general in Washington gave some idea of just how wealthy prospectors could become from the Mother Lode:

"From this point [Weber Creek, near Placerville] we proceeded up the stream about eight miles, where we found a great many people and Indians, some engaged in the bed of the stream, and others in the small side valleys that put into it. These latter are exceedingly rich, two ounces being considered an ordinary yield for a day's work. A small gutter, not more than 100 yards long by four feet wide, and two or three [feet] deep, was pointed out to me as the one where two men (W. Daly and Percy M'Coon) had, a short time before, obtained 17,000 dollars' worth of gold. Captain Weber informed me that he knew that these two men had employed four white men and about 100 Indians, and that, at the end of one week's work, they paid off their party, and had left 10,000 dollars' worth of this gold."

It became common practice for prospectors to band together, forming companies to build elaborate machinery and work their claims. Some built flutter-wheels on the rivers; these crude water-

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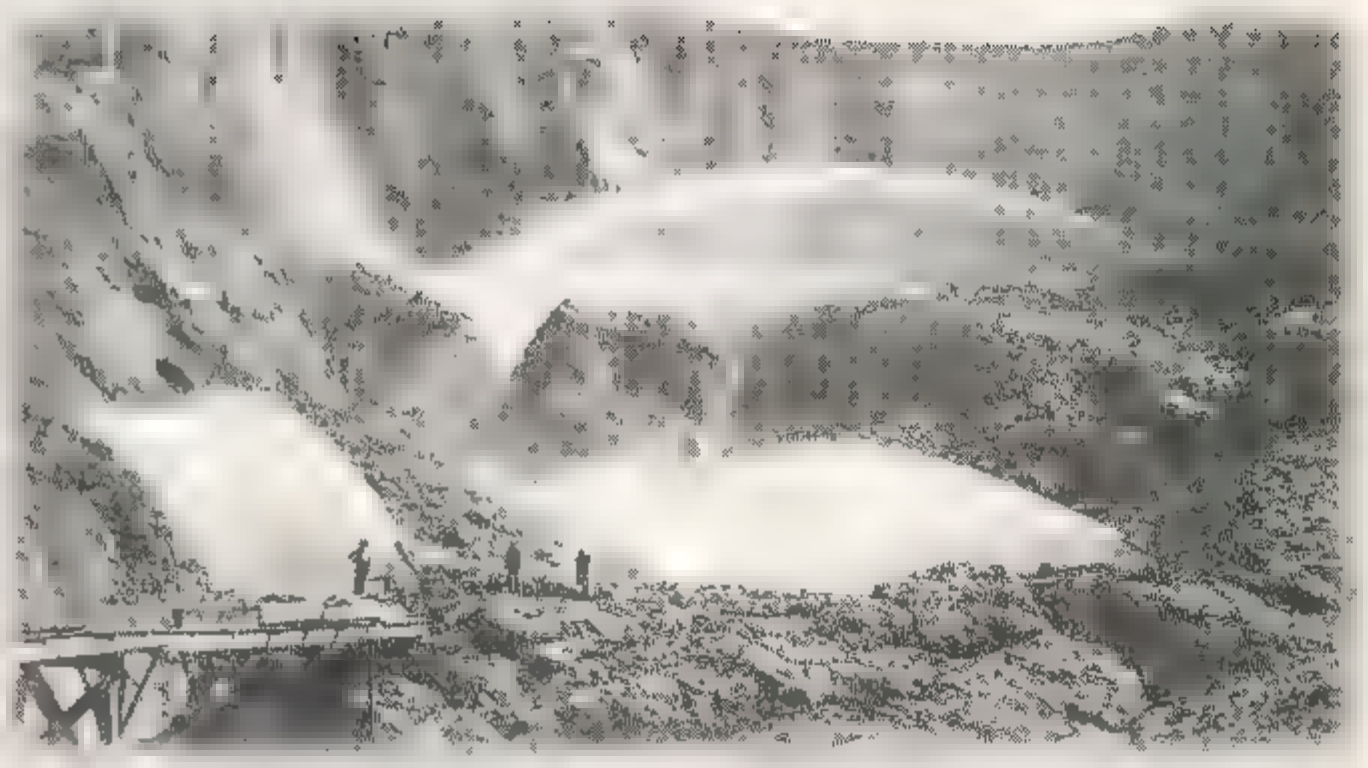

Flutter wheels (opposite, right) lifted water from the stream into sloping flumes. The introduction of hydraulic mining (above) signaled the end of the Gold Rush for the small prospector.

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wheels lifted water from the stream, dumping the flow into a sloping flume supported by pilings. This fast flow broke up and washed the dirt and gravel through the sluice box or long tom.

Lester Pelton later invented the Pelton Wheel, an immense improvement over the water wheel. With a regular water wheel, much of the stream's force was lost when the water bounced straight back from the cup into the stream. Pelton designed a cup divided by a kind of sloping ridge that channeled the stream of water away to each side, allowing all of the force from the stream to be used to turn the wheel. This was more efficient, turning the wheel faster and producing more power—an important step in the development of hydroelectric-power equipment.

Others built wing dams to work part of a riverbed, like the Sailors Damming Company: four sailors who had abandoned their ship in San Francisco Bay. It was well worth the effort, in three days' time they took out $6,000 in gold. Then their dam was washed out by the rain-swollen river.

Canaling was still another method. Across the sharp bend of a river, a canal or trench would be dug from the top of the bar straight across to the streambank at the lower end. A dam built at the upper bend diverted the water into the canal, leaving the dry riverbed to be stripped to bedrock.

Later in the gold rush, prospecting companies formed before they left home, shipping or hauling their equipment. Eastern scam artists often sold them get-rich-quick schemes. One of these was the "Quicksilver Machine." It required a water pump and flume, or homemade canvas hose, to carry water from the river to the machine. Dirt and gravel were fed into the top while the contraption was rocked to and fro, the water washing the sand through drawers containing quicksilver while another man tailed off the washed dirt. At the end of the day, the quicksilver was squeezed through a chamois skin, leaving behind only the gold. The problem was that the machine wasn't effective at getting the gold-bearing sand in contact with the quicksilver.

A more effective invention was "Giant Powder." Dutch Flat holds the distinction of being the first camp where then-newly invented dynamite was extensively used in gold mining. One claim was so rich that dynamite was employed with great success. "When the quartz vein was first worked," one miner reported, "the method adopted was to put in a blast, and after the explosion, to go round with handbaskets and pick up the pieces." Using this method, $10,000 in gold was collected after a single blast.

Most prospectors rightly concluded that there was no substitute for hard work. Once the easy placer gold was depleted, the real digging started. First there were simply "coyote holes"—one man diggings into a streambank or hillside. Drift mines were constructed and, with the discovery of productive quartz veins throughout the Mother Lode, true hardrock mining began.

Even larger mining companies were formed, providing steady employment for many miners. Cornish miners, experienced diggers in the tin mines of Cornwall, England, were hired by the companies. Some mines operated into the early 1900s, others were stopped only by lowering gold prices.

While hardrock mining lasted longer, hydraulic mining was the Gold Rush's swan song. Hydraulic mining was born when French miner Antoine Chabot first used a canvas hose to wash loose gravel into a sluice box on his Buckeye Hill claim. The next year, other miners expanded on his idea, using sturdier hoses and adding nozzles. Neighboring prospectors were so impressed with the results that many banded together to build bigger and better hydraulic systems.

To supply the water necessary for these operations, streams were diverted into dams and reservoirs built to collect and store the water. Hundreds of miles of ditches, flumes, tunnels and pipelines brought the water to the mines to finally blast forth from the eight-inch nozzles of steel monitors. The most powerful jets of water could kill a man or large animal 200 feet away. Whole mountains eventually faced this terrible force of water, the disintegration tearing down tons of rock, gravel, dirt, small animals, bushes and trees. The gold-bearing sludge washed through deep gullies, manmade cuts or tunnels which were lined with sluice boxes.

Typical of a placer mining operation that converted to hydraulic mining was the town of North Columbia. When the miners discovered their camp was built on the richest diggings, the town was moved to its present location. This hydraulic operation worked the gravels on a large scale from the mid-1850s until hydraulic mining was outlawed in 1884. Neighboring North Bloomfield is now the centerpiece of the Malakoff Diggins State Historical Park, dedicated to the history of hydraulic mining.

All of these innovations and those that today's prospectors enjoy, like electronic metal detectors, gas-powered dredges and gold concentrators, are designed to do two things: find gold-bearing dirt and then separate the black magnetite sands from that gold. The one thing all prospectors can be sure of is that there will forever be inventors and entrepreneurs to bring us the latest in gold-retrieving equipment. ***R&G***

Rock&Gem

THE EARTH'S TREASURES • MINERALS AND JEWELRY

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The Epidote Crystals Of GREEN MONSTER MOUNTAIN

In Search Of The Fabled "Smithsonian Diggings" In Alaska

by Lee and Margaret Myers

Between 1902 and 1923 mining was active at the Jumbo Mine and smaller mines on Prince of Wales Island, Alaska. In addition to copper, fine-quality epidote crystals were found in "pockets."

According to *Dana's Manual of Mineralogy*, revised by C. S. Hurlbut, c1941, epidote has the following characteristics:

Color Yellowish to blackish green
Chemical Composition $Ca_2(Al, Fe)_3(SiO_4)_3(OH)$, the ratio of aluminum to iron varies from 6:1 to 3:2
Crystal System Monoclinic; C. {001}, one cleavage direction
Specific Gravity 3.35-3.45
Hardness 6-7

Remarks: In prismatic crystals striated parallel to length. Found in metamorphic rocks and crystalline limestones.

After the mining heyday of the 1920s, many prospectors continued to comb the surrounding areas for mineral deposits; interest was focused on finding commercially viable copper deposits. The story has it that Ferguson found a crystal unfamiliar to him and sent it to the Smithsonian Institution for identification. It turned out to be an epidote crystal and its superior quality caused quite a stir in the mineralogical community.

In the summer of 1935, an expedition of mineralogists went to Alaska for the Smithsonian Institution (Montgomery, Over and Henderson). With help from Ferguson, they located a garnet diopside skarn zone on Green Monster Mountain which yielded pockets that occasionally contained epidote crystals, quartz crystals, pyrites partly altered to limonite, actinolite and magnetite. The group's summer of digging yielded many crystals. Most noteworthy were the superb epidote crystals.

Then, for years, the claim lay idle.

In the early 1960s, inquiries, information and encouragement the late John Hufford of Omaha, Nebraska, prompted Lee into action. Lee (living in Wrangell, Alaska, at the time) chartered in to Prince of Wales Island a couple of times, looking for the "Smithsonian diggings."

Because of the steep terrain, thick vegetation and limited time, his initial attempts were unsuccessful. In July 1964, however, Lee and his son Jerry did find the rubble and tools left by the expedition from the Smithsonian. In the talus they found some epidote and quartz crystals! That was the beginning of 15 years of digging for Lee.

The skarn zone was on one of several patented mining claims owned by Estil Anderson, a mining geologist in Spokane, Washington. Anderson gave Lee exclusive epidote mining rights on Green Monster Mountain in exchange for a percentage of the "take." Some trips yielded beautiful crystals, other trips nothing more than insect bites and callused hands.

During the years that Lee had "digging rights," many unauthorized people also dug in the area. Because Green Monster Mountain is in a remote area, it was difficult to monitor the activities of would-be collectors.

1967 The National Geographic So- sponsored an expedition (Dr. G ...zer, Dr P Leavens, R Thomssen ...the current owner, D To.and) to the ...y to study its mineralogy During ...summer the group spent two months ...ng, collecting crystals and studying ...geologic formations of the area

Epidote occurs commonly in crys- ...line metamorphic rocks, as gneiss, ...bolite and various schists, where it ...the product of alteration of such min- ...als as feldspar, pyroxene, amphibole ...bivite While there are many local ...s in the world (Austria, France, Italy, Mexico and, in the United States Neva... California, Connecticut, Virginia, ...sylvania and Alaska) that produce ...idote crystals, the quality of those ...m the Copper Mountain Mining Dis- ...make it a classic epidote crystal lo- ...y

To answer the frequently asked ques- ...'What good is epidote?' I explain ...occasionally epidote is used as a ...stone for jewelry, but primarily it is ...admired because of its intrinsic nat... beauty Crystal collectors, scientists ...naturalists appreciate epidote be- ...use the crystals come in a variety of ...pes, frequently with quartz crystals, ...ite or magnetite for added interest ...e majority of crystals are damaged, ...ched or starting to alter, but some are ...exquisite singles or groups of bright, vit- ...ous luster pistachio- to transparent ...rn-green crystals that look black ...m a distance These crystals are ...und in the sod below pockets that have ...oded or in pockets themselves The ...ockets vary in size Most we found were small (6 to 18 inches) usually had ...ganic mud (from roots) And usually ...e crystals were detached from the ma... ...just lying loose in the mud

...ach pocket was like a surprise pack- ...ge because of its contents or lack there ...f Epidote crystals varied considerably ...r shape, size and quality Many had ...quartz crystals some even had Japan- ...ese Law orientation or phantoms and in- ...clusions. Occasionally, we found crys- ...als which had been broken and another ...rystal had grown in between the spaces

While the ultimate goal of a rock ...unting trip is to find rocks or in our ...ase, epidote crystals the adventure, ...e countryside with its indigenous fau- ...a and flora are equally important. While southeast Alaska is known for its ...gged beauty and lush vegetation in the ...summer it is also known for its sum- ...er rain and fog, and biting insects On ...a beautiful sunny day, the insects can ...early drive a person mad, even when he ...she is using insect repellent

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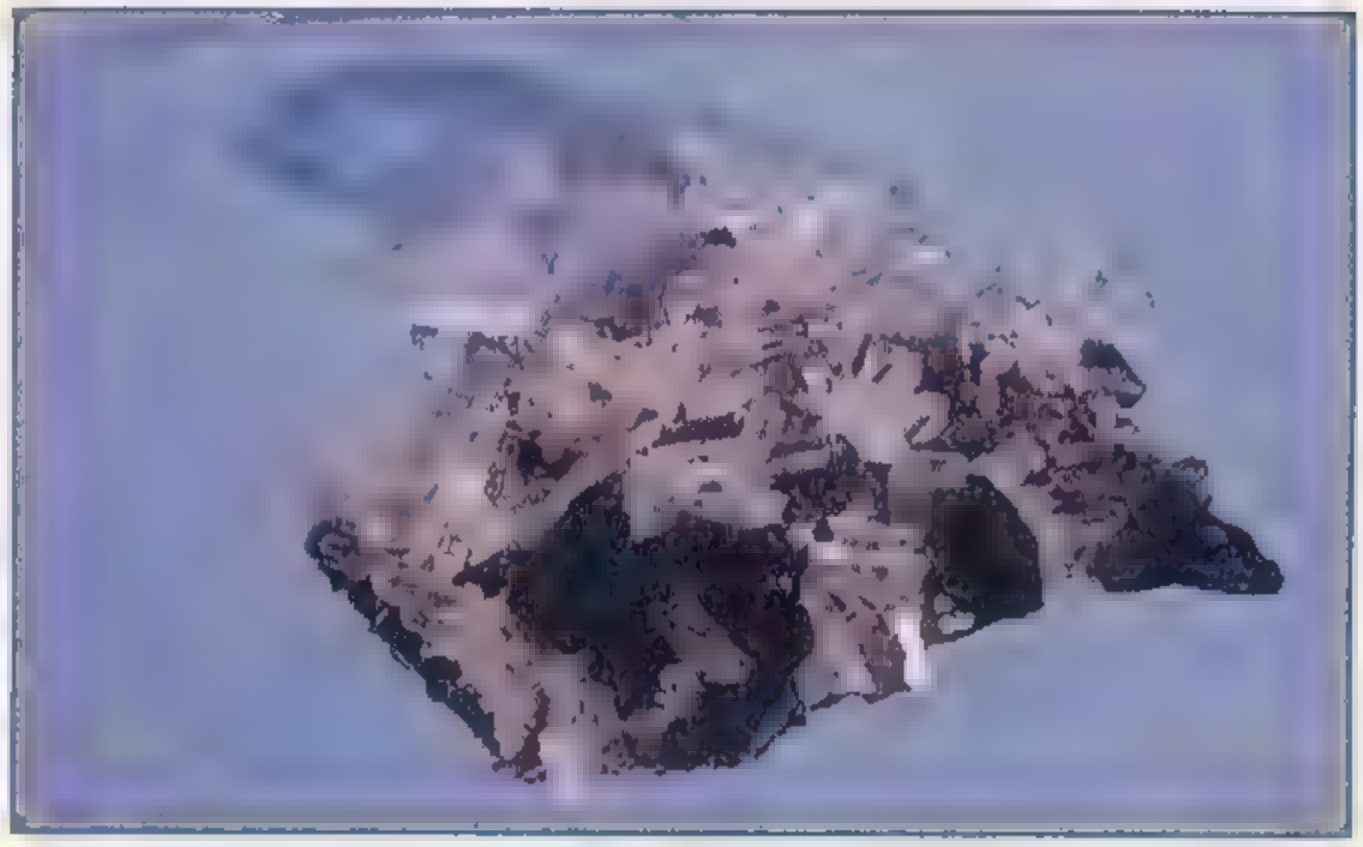
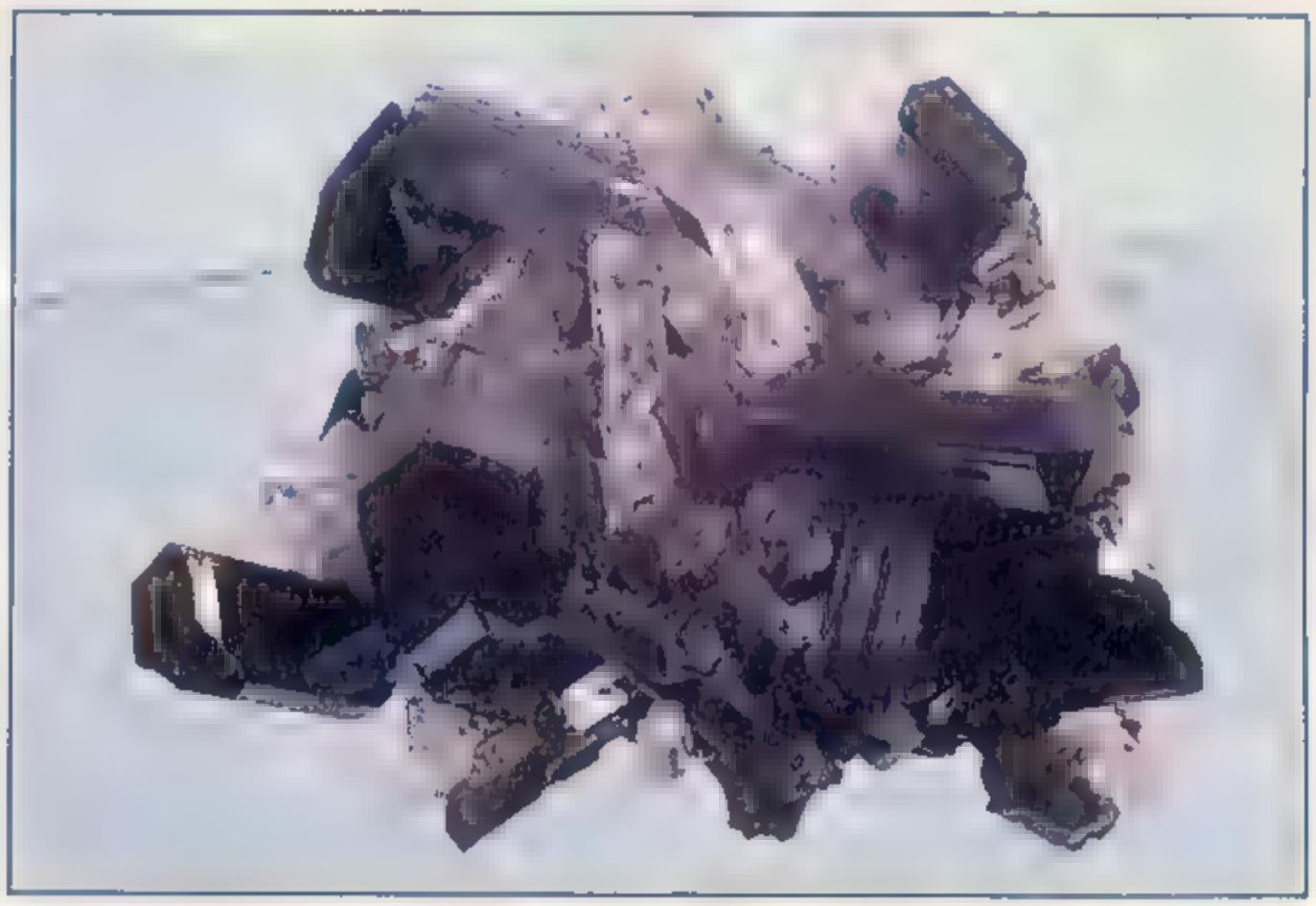


Note the choice Japan Law twin quartz on this fine epidote specimen.

Another choice specimen from Prince of Wales Island, Alaska



What makes the Alaskan epidotes so attractive is their association with wonderful crystallized quartz.

Epidote Crystals/ *from page 65*

There are many bears on Prince of Wales Island. Most of the time, they are entertaining, but they can be a nuisance. On the 1964 trip, Lee spent an afternoon cooking a venison roast dinner; took a short break and returned to camp just after a bear had swiped the cooked roast—aluminum foil and all! The bear kindly left the rest of the deer carcass for Lee to cook.

Shrews, mice, martins and blue jays are the far greater threat to food supply—which can be a potential problem in a remote area.

After digging long hours, we always slept really well. One morning, Lee said, "I had a dream that seemed so real! I dreamt I got porcupine quills in my arm."

When I was straightening up the sleeping bags in the pup tent, I found two quills! Apparently the porcupine had walked by, brushing against the tent, and Lee moved and was slapped! Not a dream after all.

Excerpts from Margaret's Diary

JULY 1, 1977: *Rain in morning, nice afternoon. Up early. Worked hard and diligently—dug, studied, hoped and slabbed—no pockets. After supper, watched bears. So peaceful!*

JULY 2, 1977: *Fog and rain. Dug, dug, dug! Rough digging in the brushy vegetation and sod. Lee located one partially exposed pocket, few little crystals. Birds singing. Walked up on ridge and looked down on Josephine Lake. Wrists chafed from wet, gritty jacket cuffs. Tired and sore, to bed.*

JULY 3, 1977: *Sunday. Foggy, few sprinkles. Lee played harmonica—hymns at 0430, sunrise service! The usual hot washcloth, tea and breakfast in bed for Margaret. Lee's so sweet! Found a few small pockets; one had a small but choice epidote with quartz crystals. Delighted; we needed that! It's amazing how a beautiful crystal can erase the misery of raw wrists, blistered hands, soggy feet and the annoyance of insects. Bear kept us company from below the diggings.*

JULY 4, 1977: *Foggy, few sprinkles. Bugs ferocious, thank heavens for head nets and Cutters insect repellent! Found a couple of pockets—nothing much in them. Should have been, though! Too bad. Spend about 10-14 hours per day digging—often from ropes. Steep slope, vegetation and tailings pile slippery. Saw bear in evening.*

JULY 5, 1977: *High overcast, ice on puddles. Found a couple pockets. Lee's was long—few nice crystals but many that might have been. A bit disappointing. We work so hard. Cleaned crystals in the evening and watched bear.*

JULY 6, 1977: *Beautiful sunny day, ice on puddles. Up early! Walked over top of Green Monster Mountain, elevation about 2,960 feet. Alpine flowers exquisite above timberline, view breathtaking, rock and mineral formations interesting. To diggings by noon. Three pockets ... little more than teasers. Wonder if there are any crystals left? Bear used small tree to wipe insects off his face—poor bear. Comical.*

... And so went the days; each beginning with renewed hope of a spectacular epidote specimen, but usually we settled for less. Some of our very best, and some of our most miserable, memories are of digging for epidote on Green Monster Mountain, Prince of Wales Island, southeastern Alaska.

We were privileged to have had that opportunity.

Epidote: The Exception To The Rule

It's hard to believe the pistachio-colored granular mineral, epidote, seen in some metamorphic rocks is a chemical relative of that gorgeous blue gem tanzanite. Tanzanite is the gem variety of zoisite, one of three rock-forming minerals that are closely related chemically. The three are zoisite, epidote and clinozoisite. They form a continuous series of rock-forming minerals. All three can be created by metamorphic action and include contact metamorphic deposits.

Epidote is a calcium, iron, aluminum silicate hydroxide. Tanzanite, the gem variety of zoisite, is calcium, aluminum silicate hydroxide. The obvious difference is the presence of iron in epidote, an element which accounts for its green color.

The minerals that make up metamorphic rock seldom occur as the fine crystals which appeal to collectors. Epidote is probably the best exception to that rule. It has been found in sharp superb crystals of brilliant luster and exceptional form.

The locality that is usually considered the greatest source of epidote is an old European deposit near Unterzalsbachtal, Austria. Here the crystals were found enclosed in bright-green byssolite, a form of chlorite. The blades of epidote from here are prismatic monoclinic, with some crystals reaching seven or more inches in length. Many are quite slender, perfectly terminated, and often lustrous to the extreme. Most crystals were found in parallel clusters, each crystal having a different length, so the specimen displayed multiple terminations. Some were also found jutting from a mass of byssolite, though many such groups are actually "enhanced," wherein single crystals have been embedded in the byssolite—a practice that dates back to the last century.

Other localities of more recent vintage are Pakistan and Peru. The Pakistan crystals are often gemmy brownish green, sharp and lustrous. They do not form large clusters as was typical of the Austrian epidotes. But their quality places them high on the epidote collector list.

The Peruvian epidotes are more needle-like, found in radiating groups of needles associated with quartz. Some needles reach six inches in length. The color of the Peruvian material tends to be a light green of modest luster.

Here in the United States, fine prismatic epidotes have come from the Jensen Quarry in Riverside County and from the Miracle Mountain Mine, Volcano, Calaveras County, both in California. These localities have produced superb crystal groups but in very limited quantity.

From Nevada, on the Julie Claim, Mineral County, have come prismatic crystals approaching five inches. They are often deeply striated and occur as singles or in groups of two or more crystals.

Another source of epidotes has been the Calumet Iron mine in Chafee County, Colorado. Here, the crystals occurred abundantly in platy groups of small crystals that seldom reach an inch long. They tend to have light-green edges with a darker-green body and are often poorly attached to the matrix.

Without a doubt, America's best epidote locality has been a remote garnet-diopside skarn zone on Green Monster Mountain, Prince of Wales Island, Alaska. Here, superb, blocky-to-prismatic crystals of dark-green, almost-black color have been collected sporadically since the discovery of the deposit. Collecting at this locality has always been a challenge and two of Rock & Gem's contributing writers, Lee and Margaret Myers, formerly of Wrangell Island, Alaska, have had the experience of collecting the site a number of times. Some of their experiences are portrayed in the accompanying article, "Revisiting Yesteryear: Epidote Crystals of Green Monster Mountain."

Two outstanding characteristics of the Green Monster epidotes are the twinning habit seen in nearly all the crystals that occur there. This twinning is obvious when you look down on the termination to see the typical chevron pattern created by the twins. Also, the epidotes here occur with quartz crystals—a common association with epidote in a number of localities. But here crystals are often attached to, and embedded in, the larger epidotes. The finest crystals of this association are the epidotes with attached glass-clear, perfectly terminated, Japan Law-twinned quartzes attached to the prism faces or as part of the matrix with the epidotes. Years ago I traded with Lee and Margaret and was fortunate to be able to obtain excellent examples of these epidotes.

—Bob Jones

Looking For PICTURES

Owyhee picture jasper created "Mt. St. Helen's."

When Nature Is The Artist

Imperial jasper cab with a tornado crossing the landscape.

by Max A. Hatch

We are all acquainted, to some extent, with some of the various picture rocks. A few of the more famous, and common, are Biggs picture jasper, Wonder Stone, Montana picture agate, and the many different mines of Owyhee picture jaspers. These are, by no means, all of the picture stones, but they do represent many of the more well-known ones. But did you know that you can find pictures in just about *any* stone?

It's true! You can find pictures of various objects or scenic views in just about every type of stone used by the average lapidary or rockhound. Of course, not every piece of every stone is going to hold a portrait of the Mona Lisa or a view of the Grand Canyon. But enough will have something interesting in them to make the search worthwhile.

My very first piece of lapidary equipment was a Lortone tumbler with twin barrels. I don't know how many pounds of rocks I have polished with this unit, but the tally is an enormous amount. To start with, I would take rocks that I had carried home from some other activity or purchased at a local rock shop or event and just hit them with a hammer until the pieces were small enough to fit in the tumbler. After the weeks of polishing were completed, some of the pieces would become baroque pendants, rings or whatnots ... lots of whatnots! I think every flowerpot I owned had a layer of polished stones at the base of the flowers!

Soon, I discovered that some of these pieces were much more interesting than the others—maybe not in the resulting shape, but in the stones themselves. I might have discovered a piece that had a portion of a desert view or maybe a mountain slope or wooded valley in it. For the first time, I started looking carefully at the larger pieces before hitting them with the hammer.

As time progressed, I acquired more lapidary equipment, including saws, grinders and polishers of various types. This enabled me to make more controlled pieces. Instead of a random hammer blow, I could now saw a slab of stone at a certain angle. This made it possible to take advantage of any initial knowledge I had of a stone. If it had been chipped, as most are, then I could try to determine which angle would result in the best pattern for a slab—one that might result in a "bragging rights" cabochon!

As I cut many slabs from various picture stones, I realized that there was still a very large amount of luck involved with getting pretty picture pieces. Sometimes the chosen cutting angles would result in patterns that, although scenic, were large for practical pieces of jewelry. Many, many times, a particular pattern or shape would be ideal on the face of a slab, only to be distorted or lost completely in the grinding and polishing process.

I'll never forget a piece I worked once. It was a fairly large piece of Bruneau jasper. It had an interesting pattern to it, which was different from the more usual so-called egg-type pattern. It was to become a pendant for my wife. As I was grinding the somewhat oval shape, the pattern of a rose in full bloom appeared! As soon as I realized what I had, I started to adapt the shape of the stone to take advantage of the pattern. All went well for some time. Then disaster struck! As I was finishing the fine-sanding step, the distinct pattern started to change. By the time I had

completed the final polishing, a distinctive pattern was left, but it was no longer a blooming rose! We still have this piece and neither of us can look at it without remembering the lost rose!

This is one reason many scenic pieces are finished as flat slabs: The person doing the work is afraid of losing the pattern. Instead of continuing to contour a piece to make a cabochon or a piece for a belt buckle, the lapidary leaves it flat and polishes it in that shape. Of course, many fine scenes are the result. There is certainly nothing wrong with this.

If you have one of the picture jaspers, you can usually dome it with no fear of losing the pattern. It may change slightly, but the basic scene will probably still be there. When I first started cutting cabochons, I cut a lot of these. I was in the middle of an area rich in this type of material and I was determined to cab it all! In the process, I outfitted all my relatives and most of my friends with picture-jasper belt buckles, bolas, pendants and even rings.

This is probably the most common cabochon made, a 40x30mm cabochon of a picture jasper. The next most common is probably one with a dendritic tree or bush in it.

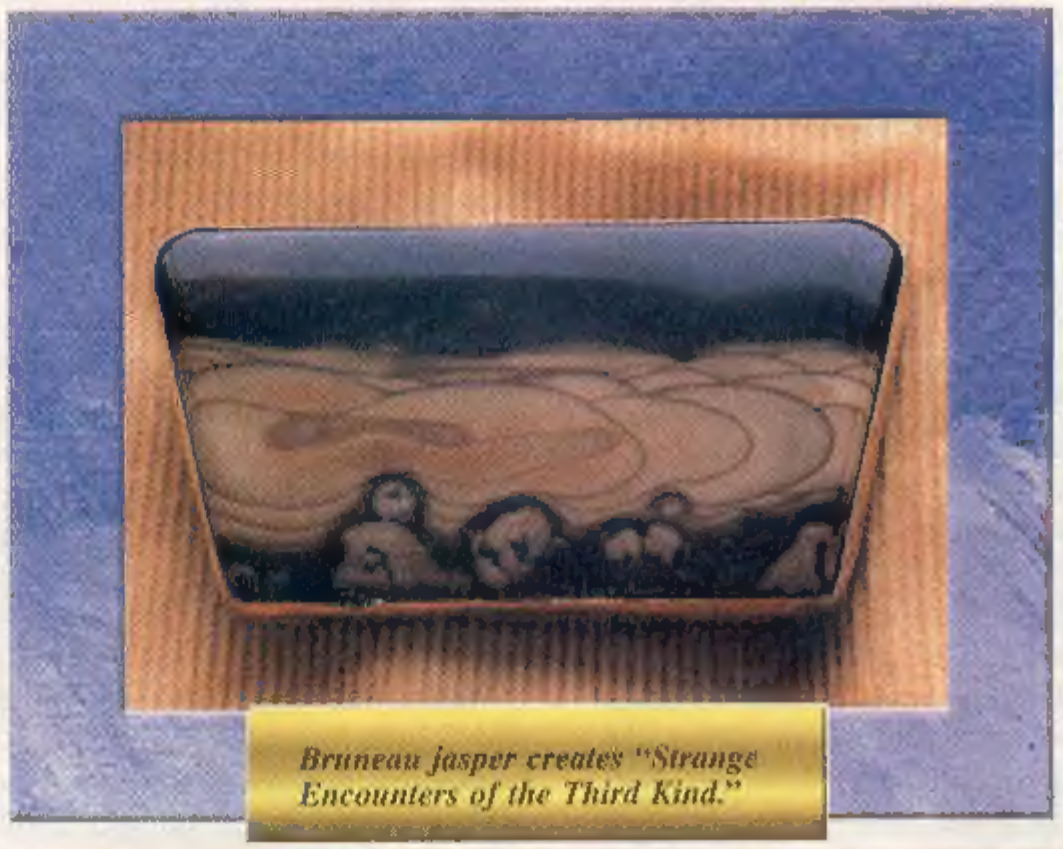
With careful planning and care in selecting the rough material, gorgeous jewelry can be created with these cabs. I know I still take considerable pride in creating with them.

A person does not usually consider the possibility of finding scenes or objects in much of the material that is not normally associated with them. These would include banded agates and many of the more common jaspers. (Many jaspers and agates are known for their banding, colors or other features, but not necessarily for scenes.) These are the ones in which I take most pride in locating something out of the ordinary!

Luck usually plays a large roll in locating these. You usually cut your rough into slabs to maximize that which you expect to find. If, in doing so, you stumble across something unusual and completely unexpected, you must be prepared to recognize it before it is too late and the pattern is destroyed.

I once had a need for some rather plain banded-agate cabs. A particular agate, locally called Carey agate, was readily available not far from home. A short day trip to the area provided all the rough material I needed. My saw turned the rough into slabs and I was busy cutting them to the required sizes and shapes when I realized that one of the pieces had bands that formed the exact outline of the state of Idaho! By then, it was too late and I could not salvage the piece. Since then, I have cut hundreds of pounds of this same material. I have found some that generally resembled this shape, but none that matched the original. Had I been paying more attention, I would now have another unique piece in my collection.

Morrisonite jasper with a forest glen, a Botticelli cherub and the face of a wolf.



Bruneau jasper creates "Strange Encounters of the Third Kind."

This on-top-of-the-clouds scene fits the bola beautifully.

Many well-known materials are known for their beauty. This may be due to their colors, patterns or other unique features. Plain Montana agate is a very unimposing stone. Find a dendritic inclusion in the shape of a tree or bush in it, and you have a thing of beauty. Willow Creek jasper has about the prettiest pastel colors I have ever seen. Morrisonite jasper is famous for its colors that can resemble undersea scenes. Biggs jasper is famous for its dark coloration and banding that resembles mountain scenes. Bruneau Canyon jasper is best known for its cream and brown colors showing distinctive eggs.

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Pictures/ *from page 81*

I was making a cabochon from a piece of Bruneau jasper when I first became aware of other possibilities. This was years ago, when Bruneau was still plentiful. This jasper is formed as nodules that are imbedded in some of the hardest rhyolite I have ever seen. I understand that miners were discarding most of the smaller nodules in favor of the large ones that would produce spheres of 10 or more inches in diameter, showing huge eggs.

The slab that I had was considered a low-grade piece. I was still new to lapidary and learning as I went along. Anyway, I was going to make a cabochon that would fit in a belt buckle I had just bought. I used my template to mark the appropriate-size oval over some of the patterns in the slab. The cab was then trimmed from the rest of the slab and the edges ground to size and shape. The doming process was started. As I was grinding away, I could not help but notice that the eggs were evolving more and more into the shape of a portion of the female anatomy. When the cab was finished and mounted in the buckle, I named it "Dolly Parton" for obvious reasons. This cab is still in this same buckle, which I wear more than any other.

The cab was badly scratched while I was bringing a huge plate of druse quartz off a mountain. I had to regrind the surface to remove some deep scratches. The features changed slightly, but as you can see in the picture, the name is still apt.

Later on, I showed this buckle to Gene Anthis, who owns much of the Bruneau mine. He offered me $50 for it on the spot. Needless to say, *I* still have the buckle!

There are thousands of pieces of polished Bruneau jasper in circulation. Most are finished to feature the eggs, and they are beautiful. It also happens to be one of my favorite materials for finding unusual scenes. Several years after "Dolly" appeared, I had slabbed a smallish nodule that produced another anatomical feature. You are probably familiar with the statue titled "The Thinker." Well, my cabochon was named "The Stinker." I no longer have this piece, as I set it in a buckle that was given away as a present.

Another nodule of Bruneau produced two slabs that were almost identical. They were very pleasing to look at but did not immediately stand out for me. I was teaching myself silversmithing at the time. I had cabbed one of the pieces into a semishield shape and was making a silver bola to put it in. One of my friends, who is a commercial pilot, happened to see it. He held it up and said, "This is what you see when you break out on top of thick cumulus clouds." The second slab was turned into a hatband pin for him. He was still wearing it when I last saw him several years ago. The moral to that story is that different people can see different things in the same picture.

One day I was cutting some Imperial jasper, looking for some distinctive color combinations, when I noticed a scenic view. Right smack in the middle was a perfect depiction of a tornado! The whole thing is nicely framed and even has a streak of lightning in the background. You can almost feel the tornado moving across the landscape!

When you see something unusual in a piece of stone, stop and think about what can be done with it. I know I am guilty, many times, of rushing through the selection of patterns and stones when I am making a piece. It is quite natural to get tunnel vision and only see one result for a project. Take the time to explore each phase of the process.

Perhaps my all-time favorite stone is a piece of Morrisonite jasper. I had purchased several chunks of rough at the Filer Gem Show, in Filer, Idaho, back in the late '60s or early '70s. Over time, I had slabbed and cabbed most of them. But there was one piece that never got touched. After we had moved to Arizona, my wife asked me to cut a slab of Morrisonite for a project she was making. I clamped this piece in the vise of my slab saw and proceeded to cut it into several slabs. As each slab came off the saw, I tossed it into a bucket of kitty litter. When finished, I told my wife to take whatever she needed, when the oil had been soaked up by the kitty litter (a neat trick, in case you're not familiar with it).

She chose a slab or two, and I didn't really think much more about it. She was taking a silversmithing class at the Mesa Arts Center, at the time.

Well, a few weeks later, she presented me with a bola tie made from this slab of Morrisonite. It is absolutely gorgeous! It is a large teardrop shape set in a semishadow box mounting of plain silver. Nothing detracts from the stone. Immediately, I could see what appeared, to me, to be a view of sunshine rays shining down in a glen in a forest. She said, "Keep looking," and in the top right of the stone is the rear view of a Botticelli cherub. Just as plain as day, flying up toward the clouds. We have both admired this bola for years and, of course, it has come to be the standard by which we judge all Morrisonite.

I had worn this bola for several years, when I happened to have it on while attending a large Native American show. One of the first Indian artists we saw looked at it and said, "That is quite a wolf you have there." We asked what he meant. He replied that there was the head of a wolf in the stone in my bola tie. I removed the tie and looked at it. All I could see was the familiar glen, sun rays and cherub!

He said to look for an eye. We located what could be an eye. He said to look for another eye and a nose. Then it jumped out at us. Two ears, two eyes, a snout and nose! ... The distinct shape of a wolf's head! Neither of us had noticed this image before, as we had always concentrated on the cherub!

This scene was in only one slab of the Morrisonite. The slab in front had more normal patterns in it and the slab behind had part of the glen-like scene. I turned it into a pendant for my wife, but I'll admit, it is not nearly as spectacular as the bola she made for me!

One of my favorite pieces of Bruneau jasper is made into a belt buckle. I had just finished cutting and polishing the stone when we saw the movie *Close Encounters of the Third Kind*. I think it is obvious why this became the name of this particular buckle!

We are sure that many dealers and other customers must think we are batty as we stand and look at cabbing material. Not only do we spend much time looking and turn each piece every which way, we try to imagine how the pattern will appear further inside the piece. We may even get a case of the giggles if we can see something, or the possibility of something, humorous. I purchased a piece of Bruneau jasper once that I still have not cut. It has an interesting, but not classic, pattern in the center of the slab. What really interests me though, is the ring of flames that circle the edge of the slab. I am still waiting for the inspiration to use this piece.

An old friend of mine, the late Ray Moon, had a piece made from some Montana agate. Instead of the expected dendritic inclusion of a tree or shrub, there was the image of a golfer at the beginning of a golf swing. Almost everyone that does much slabbing and cabbing has at least one extraordinary piece such as this.

In the photo of the unfinished cab, you can see the profile of an old man with a beard. Also, if you look at the left side of this piece, there is another profile of a face with hair, nose, mouth, chin and cheek showing. So far, I have been afraid to finish grinding and polishing this piece. Looking at the edge of the bottom of the cab, where some end pattern is exposed, it doesn't appear to penetrate very deeply into the stone. I am afraid that the pattern would disappear, or at least be drastically altered, by grinding and sanding it. Perhaps, I will just polish it flat someday. By the way, this cab came from a piece of Owyhee Picture jasper, known for its landscape scenes. You just never know what you are going to find!

The cabochon next to it, which I call "The eruption of Mt. St. Helens," came from a similar Owyhee jasper, but a different mine. It is interesting to note that none of this scene is visible on the back of the cab. The entire top is just a blank, blue color, with a small line of brown running across the bottom with no indication of a mountain, dust clouds or anything else. The angle a piece is slabbed can mean everything!

Now, all this does not mean that you should stop cutting and polishing stones that do not hold unusual pictures. On the contrary, I plan to continue collecting and cutting material based on what it is famous for: color, pattern, etc. And so should you. Just keep a lookout for the extraordinary piece. It just might be a real keeper!♡